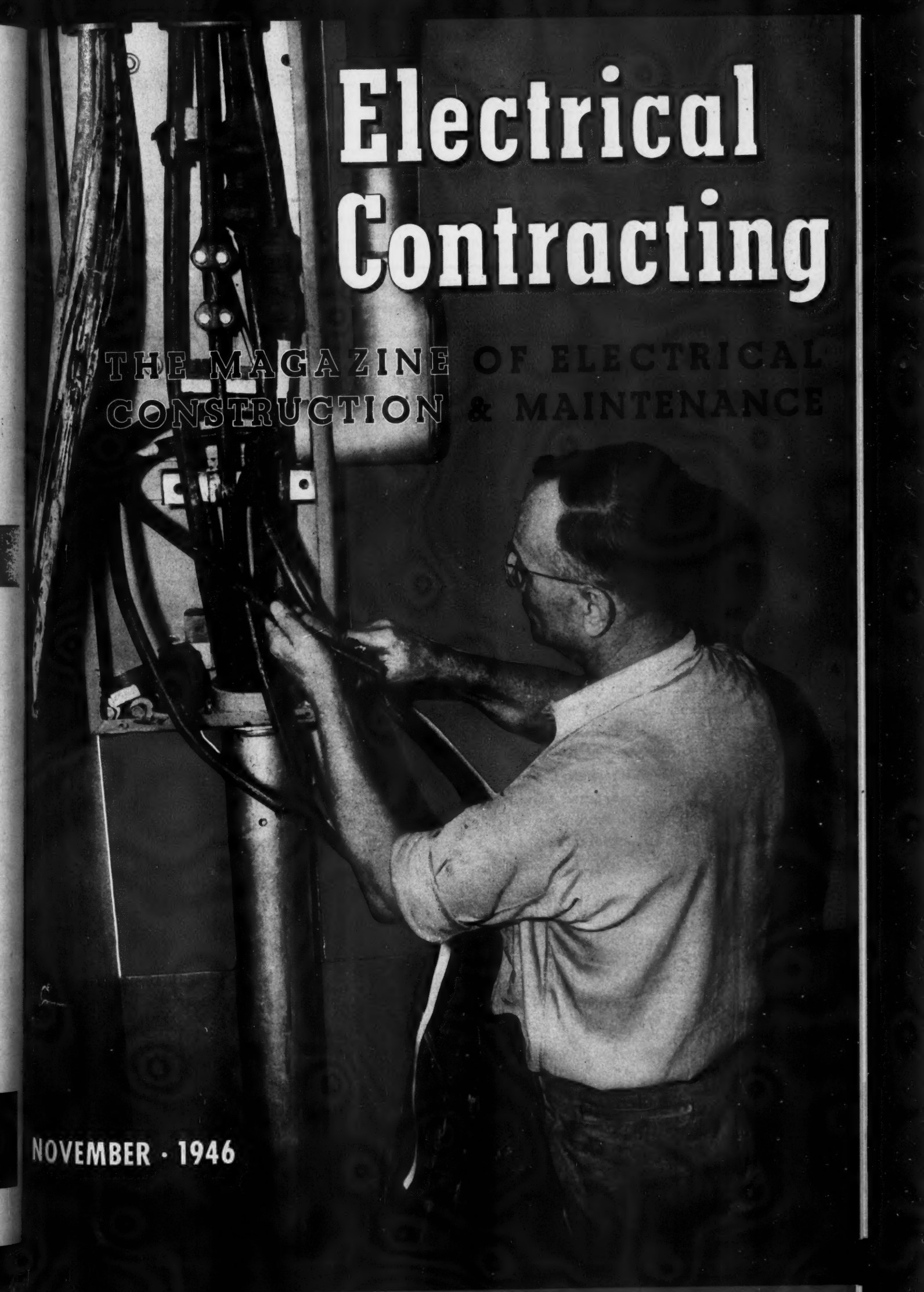

Electrical
Contracting
THE MAGAZINE OF ELECTRICAL
CONSTRUCTION & MAINTENANCE
NOVEMBER · 1946

WHERE WIRING MUST STAND UP TO...

OILS *Cutting oils, lube oils, and coolants won't damage it.*

ACID *Neither battery acids, nor other mild acids and alkalies harm Flamenol.*

WATER *Flamenol will take months of continuous immersion, and come out as good as new.*

FIRE *Flamenol can't help a fire along, as it will not support combustion.*

HEAT *Flamenol is unaffected by any heat to which wiring is normally subjected (as high as 80 C).*

WEATHER *Ordinary low temperatures or sunshine won't hurt Flamenol.*

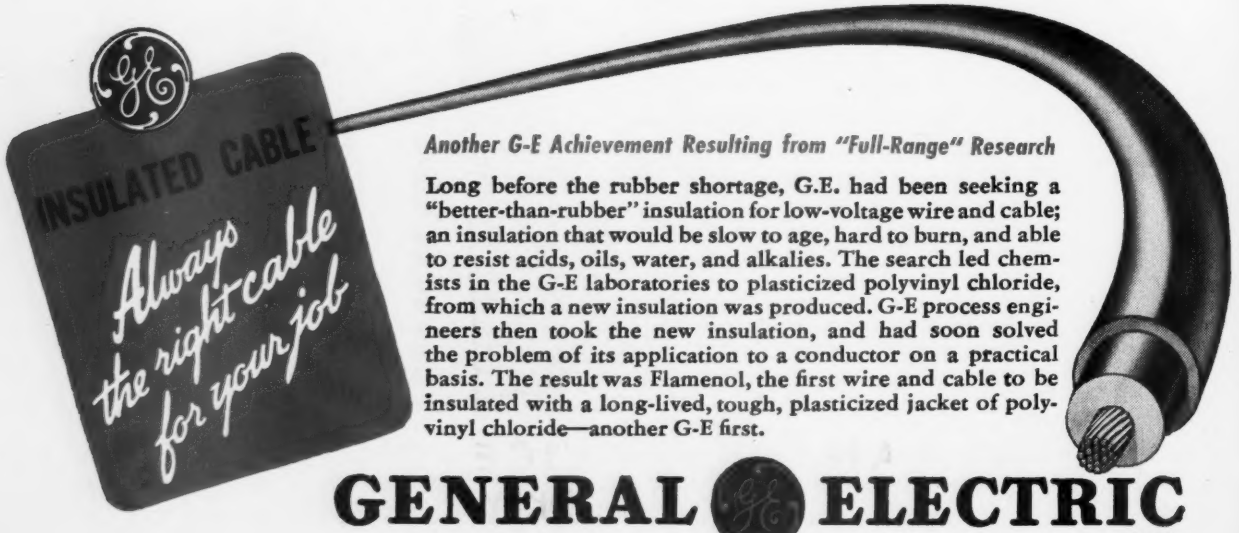
Specify FLAMENOL cable

Industrial operations and conditions that menace most wiring seldom harm the tough, flexible polyvinyl-chloride insulation of Flamenol* cable. That's why over 250,000,000 feet of Flamenol wire and cable have been installed in rough-on-wiring locations. You'll find it holding up on rayon-spinning machines, battery-charging equipment, printing-press controls. It's working overtime in canneries and tanneries. Chances are where you find wiring exposed to oil, grease, gasoline, printing inks, corona, weather and abrasion, you'll find Flamenol on the job.

Suitable for applications up to 600 volts, Flamenol's small diameter saves space in crowded quarters, while its smooth, tough, glossy surface eases pulling through conduits. Although it is free-stripping for easy connections, it's tensile strength of 1,500 lb per square inch means it can stand a lot of abuse.

There's a Flamenol cable for almost every wiring application. Write for Bulletin GEA-4352. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

**Trademark Reg. U.S. Pat. Off.*



Another G-E Achievement Resulting from "Full-Range" Research

Long before the rubber shortage, G.E. had been seeking a "better-than-rubber" insulation for low-voltage wire and cable; an insulation that would be slow to age, hard to burn, and able to resist acids, oils, water, and alkalies. The search led chemists in the G-E laboratories to plasticized polyvinyl chloride, from which a new insulation was produced. G-E process engineers then took the new insulation, and had soon solved the problem of its application to a conductor on a practical basis. The result was Flamenol, the first wire and cable to be insulated with a long-lived, tough, plasticized jacket of polyvinyl chloride—another G-E first.

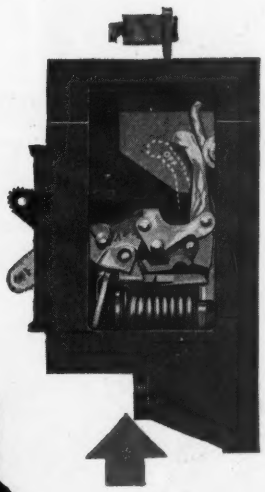
GENERAL ELECTRIC

502-55

IMPORTANT ANNOUNCEMENT

NOW *in production*—Murray MAGNETIC CIRCUIT BREAKERS

IN NEW APPLICATIONS



THESE much-wanted, new applications are shown below. The heart of each is the Murray MAGNETIC Circuit Breaker—magnetic, because, by means of magnetism alone and without thermal action of any kind, it provides absolutely instantaneous shut-off of current in the event of a short circuit and delayed interruption in the case of overloads. These compact, underwriter-approved Murray Magnetic Circuit Breakers are ready for shipment NOW. Write or 'phone your nearest jobber for all the facts, or ask us direct. Metropolitan Device Corporation, Brooklyn 16, New York.

ABOVE

The use of a magnetic tripping mechanism and an efficient magnetic blow-out provides an instantaneous circuit interruption in the event of a short circuit. A precision time-delay device accommodates the brief overloads normally encountered, such as motor-starting currents or the high initial current flow through tungsten lamps. The characteristics of the Murray Magnetic Circuit Breaker are not affected by above-normal temperatures ordinarily found in service equipment.

ABOVE

Outdoor, weather-proof, deep-drawn service equipment, supplied with one or two circuit breakers. Has a 1¼" formed hub in top end-wall.

CENTER

Outdoor combination socket-meter and load center, equipped with two circuit breakers and bussing necessary for addition of four breakers. Rust-resisting metal, aluminum finish.

RIGHT

Load centers, supplied with two or more circuit breakers. Are equipped with busses and connectors for a total of six circuit breakers. Indoor-flush and surface types — with baked-on aluminum finish.

METROPOLITAN DEVICE CORPORATION
BROOKLYN 16, NEW YORK

"Spectacular" wiring calls for spectacular insulation!

WIRING—miles of it—is what keeps the Great White Way aglow. And every mile of that wiring... particularly in the labyrinth of neon circuits... presents a tough problem in insulation. A problem made-to-order for BAKELITE Polyethylene!

"Spectacular" is none too strong a word for the job of insulation performed by BAKELITE Polyethylene! So light it floats on water, this plastic is so high in dielectric properties that wire and power cable of extremely *small cross-section* can be used to supplant older, bulkier, harder-to-handle types.

Polyethylene insulation has exceptional moisture and chemical resistance... an extremely low water-vapor transmission coefficient... it is inherently flexible and extensible... and possesses a wide temperature working range.

These are some of the reasons why BAKELITE Polyethylene insulation is winning its way into scores of new electrical applications... particularly where long service in exposed locations and small-diameter flexibility are all-important. Write to Department BJ-41 for complete information, technical data and, if you require them, experimental samples of BAKELITE Polyethylene.

BAKELITE
TRADE-MARKS

POLYETHYLENE

BAKELITE CORPORATION, *Unit of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

A practical technical and management journal for electrical contractors, industrial electricians, inspectors, engineers and motor shops, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction and maintenance.

Electrical Contracting

. . . Contents for November, 1946

With which is consolidated The Electragist and Electrical Record . . . Established 1901

November—*at a glance* 41

It Helps You 43

NECA Meets in Atlantic City 45
A report of the annual meeting of the National Electrical Contractors Association

Emergency Power for Pittsburgh 50
By HUGH P. SCOTT—What electrical contractors and plant electrical departments did to keep commerce and industry going during the recent power strike.

London Airport Wiring 52
By JOHN CHRISTIE—Temporary runway and landing lights at London's international air terminal are served through network of tile conduits designed for future system expansion.

Electronic Speed Control of Wound-Rotor Motors 54
By WILLIAM H. ELLIOT—A system applicable to printing, graphic arts and machine tool industries.

Modernization Features Lighting 56
By BERLON C. COOPER—Penn Furniture Company converts an old building into a modern store, in which planned lighting and adequate wiring represent major modernization factors.

Industrial Electrification 119
Overload Protective Devices—Part I

Departments

Practical Methods 60
Equipment News 103
Motor Shops 109
Data Sheet 122
Reader's Quiz 124
Questions on the Code 137
Modern Lighting 145
New Literature 155
In the News 163
Manufacturers News 173
Advertisers Index 188

W. T. Stuart, *Editor* • Alice McMullen, *Associate Editor* • Berlon C. Cooper, *Eastern Editor* • August Eckel, *Middle West Editor* • Hugh P. Scott, *Industrial Editor* • W. A. Cyr, *Pacific Coast Editor* • H. W. Young, *Southwest Editor* • Harry Phillips, *Art Editor* • Dexter Keezer, *Director, Economic Staff* • Donald D. Hogate, *Manager, Washington Bureau* • John Chapman, *World News Director.*

M. S. MacNaught, *Manager* • W. W. Garey, *Assistant Manager* • District Managers — A. B. Conklin, Jr., and S. A. Jones, New York • F. J. Seiler, Cleveland • W. B. Heaps, Chicago.
Lee H. Hill, *Publisher*

McGRAW-HILL PUBLISHING COMPANY, INC. • JAMES H. McGRAW, Founder and Honorary Chairman; JAMES H. McGRAW, Jr., President; CURTIS W. McGRAW, Senior Vice-President and Treasurer; JOSEPH A. GERARDI, Secretary; NELSON BOND, Director of Advertising; EUGENE DUFFIELD, Editorial Assistant to the President; J. E. BLACKBURN, Jr., Director of Circulation. Publication Office, 99-129 North Broadway, Albany, N. Y. Editorial and Executive Offices, 330 W. 42nd St., New York 18, N. Y. *Branch Offices:* 520 North Michigan Ave., Chicago 11; 68 Post St., San Francisco 4; Aldwych House, Aldwych, London, W. C. 2; Washington; Philadelphia 2; Cleveland 15; Detroit 26; St. Louis 8; Boston 16; Atlanta 3; Los Angeles 13; Pittsburgh 22. Member A.B.C. Member A.B.P.

The Case of the INQUIRING LIGHTING SALES MANAGER

Chapter Two: HIS THIRST FOR KNOWLEDGE ABOUT CERTIFIED FLEUR-O-LIERS CONTINUES

In your last ad, you defined FLEUR-O-LIERS . . .

Yes — and briefly here's the story: FLEUR-O-LIERS are fluorescent lighting fixtures made to exacting specifications, set up by lighting experts, for performance, construction and service. They are tested, checked and *certified* as meeting those specifications by independent experts, Electrical Testing Laboratories, Inc., and identified by the ETL Certification Label, shown below.

Are all the individual "working parts" of FLEUR-O-LIER fixtures Certified?

Yes—which means *ballasts* and *starters.* Those "auxiliaries" are *Certified* as meeting rigid specifications applying specifically to that equipment. They, too, carry an ETL Certification mark.

How does all this help me?

The entire FLEUR-O-LIER Certification program means definite benefits and advantages to lighting manufacturers, sellers and users . . . because it assures top lighting performance, dependable operation and reliable, economical service from fixtures wearing the *Label.*

This Label is your clue to good lighting fixtures!

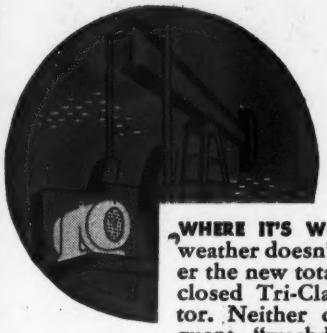
It is your definite assurance of *electrical, mechanical and lighting excellence* in fluorescent lighting fixtures!

FLEUR·O·LIER *Manufacturers*

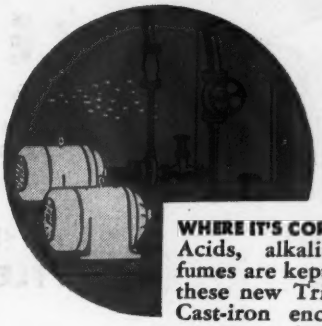
Fleur-O-Lier is not the name of an individual manufacturer, but of a group of 27 leading fixture manufacturers. Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements.

ELECTRICAL CONTRACTING. Published monthly, price 35 cents a copy. Vol. 45, No. 11. Allow at least ten days for change of address. RETURN POSTAGE GUARANTEED. Publication Office, 99-129 N. Broadway, Albany 1, N. Y. All communications about subscriptions should be addressed to J. E. Blackburn, Jr., Vice-President (for Circulation Operations), Electrical Contracting, 330 West 42nd St., New York 18, N. Y. Subscription Rates—U. S. and possessions, $3.00 a year, $4.00 for two years, $5.00 for three years. Canada $4.00 a year, $6.00 for two years, $8.00 for three years. Pan American countries $6.00 for one year, $10 for two years, $12.00 for three years. All other countries $15.00 a year, $30.00 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter August 29, 1936, at Post Office, Albany, N. Y., under the Act of March 3, 1879. Printed in U. S. Copyright 1946 by McGraw-Hill Publishing Company.

FOR TODAY'S TOUGHER JOBS, HERE'S A NEW TOUGHER MOTOR



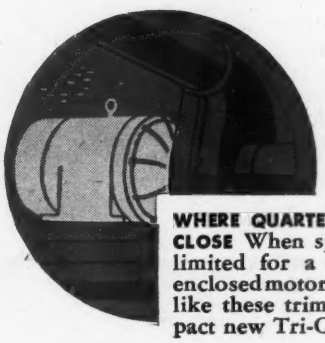
WHERE IT'S WET Wet weather doesn't bother the new totally-enclosed Tri-Clad motor. Neither do frequent "washdowns" in food plants.



WHERE IT'S CORROSIVE Acids, alkalis, and fumes are kept out of these new Tri-Clads. Cast-iron enclosures are corrosion-resistant, extra strong.

WHERE IT'S DIRTY Dirt and dust can't get into these Tri-Clads to shorten their life. Smooth surfaces are convenient to clean.

WHERE IRON DUST FLIES Harmful iron dust and metal filings can't get past the inner wall. Bearings are protected from dust.



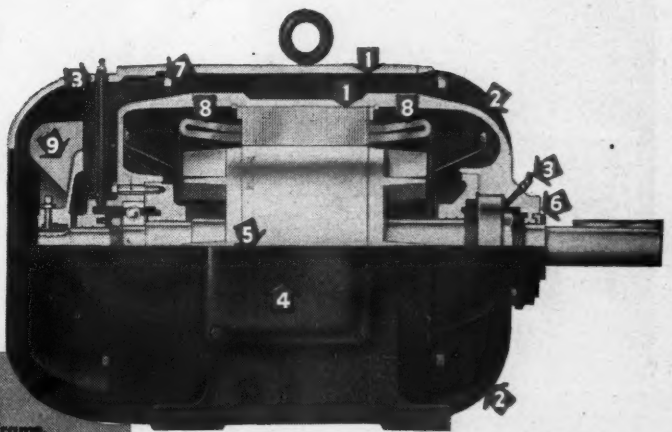
WHERE QUARTERS ARE CLOSE When space is limited for a totally enclosed motor, you'll like these trim, compact new Tri-Clads.

WHERE EXPLOSION HAZARDS EXIST The new Tri-Clad motors are available in explosion-proof constructions where needed.

THE G-E *TRI/CLAD* TOTALLY ENCLOSED MOTOR

(1 TO 1000 HP)

In 1940 you welcomed the Tri-Clad open motor with it's *extra protection features*. More Tri-Clads have since gone into service than any other integral-horsepower motor. Now G.E. is ready with a new line of tough, totally enclosed Tri-Clad motors for use in adverse atmospheres. *We believe they are industry's most dependable motors.* Their longer life and lower maintenance will make them a sound investment on almost every job. Apparatus Dept., General Electric Co., Schenectady 5, N. Y.



10-POINT PROTECTION

1. A cast-iron, double-wall frame completely encloses and protects the windings and punchings.
2. Corrosion-resistant cast-iron end shields are machined to provide a tight seal, and protect the motor from dust, dirt, and moisture. Primer and finish coat of Glyptal* varnish affords high rust-resistance.
3. A pressure-relief greasing system, which can be packed with long-life lubricant, protects the bearings.
4. The cast-iron conduit box is diagonally split for easy wiring. Boxes are independently explosion-proof on Class I motors.
5. Nonshrinking compound around motor leads protects motor interiors from dust and moisture at the point where leads pass through the frame.
6. Rotating labyrinth seal further protects motor interior from damage by foreign matter.
7. Large air passages provide adequate protection from overheating. They're easy to keep clean and open, too.
8. Modern, "ageless" insulation treatment includes windings of *Formex magnet wire.
9. The powerful external fan is removable to simplify maintenance; nonsparking type in explosion-proof motors.
10. Individual dynamic balance of rotors and external fans protects against vibration hazards, even under severe operating conditions.

*Trade-mark Reg. U. S. Pat. Off.

FOR THE COMPLETE STORY

Apparatus Department, Section J750-278C
General Electric Company
Schenectady 5, N. Y.

☐ Please send me GEA-4400, which describes the new Tri-Clad totally enclosed motors.

☐ Please send me GEA-4131, "Motors and Control for Hazardous Locations."

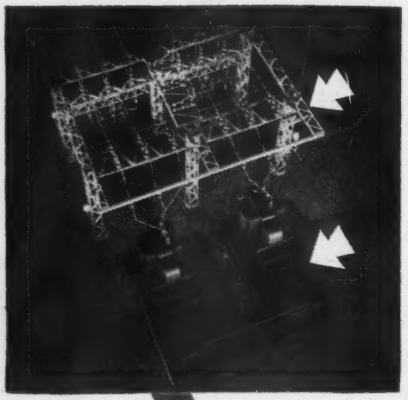
NAME.....

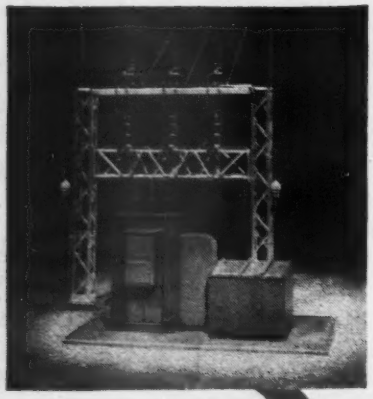
COMPANY.....

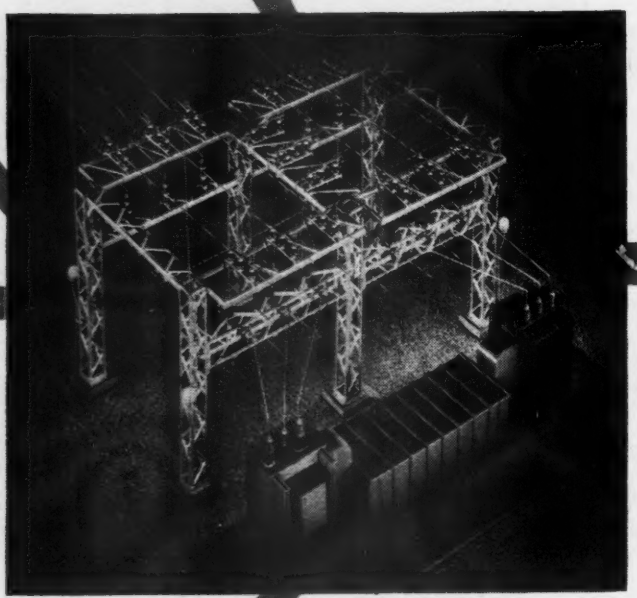
ADDRESS.....

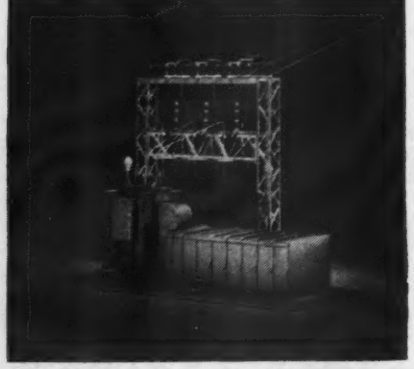
GENERAL ELECTRIC

NOW! G-E announces *Package*









✱ The new G-E *package substation* provides one complete co-ordinated package for substation applications requiring steel structure and associated equipment, together with one or more *master unit substations.*

You have all this equipment from which to select a standard package substation:

Complete Steel Structure **including**

Lightning arresters — **Buses and bus supports**
Disconnecting switches — **Station lighting**
Potential transformers and current transformers

Outdoor oil circuit breakers — ***Metering and relaying***
Master unit substations — ***Control cable***

Complete drawings and erection instructions

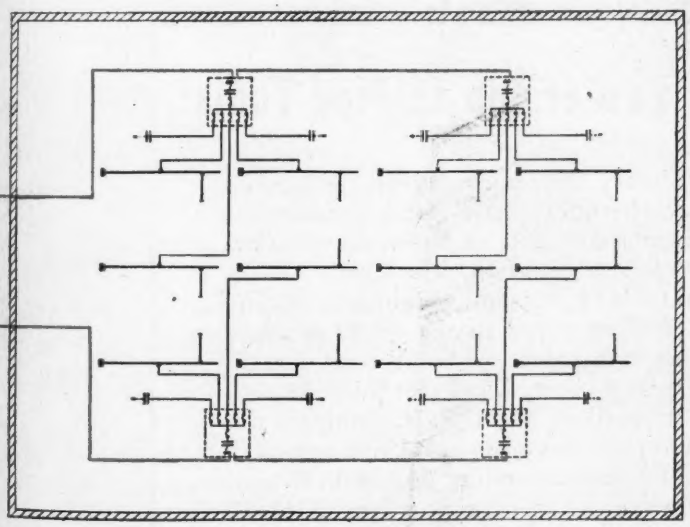
Substations*

They extend the "buy it complete" trend to applications requiring steelwork and master unit substations—with ratings from 750 to 45,000 kva; 11 to 69 kv, incoming, and 2.4 to 13.8 kv, outgoing

Here are the new G-E package substations! Clean-cut in design, complete to the last bolt of the steel structure—as compact and fully co-ordinated as modern engineering can make them.

These new package substations now extend to all outdoor substation applications the quick-ordering, time-saving, easy installation advantages so successfully introduced by General Electric's master and load-center unit substations.

The package substations you see here are just a few of the hundreds of standard combinations of the equipment



One line diagram showing how new package substation dovetails with load center system in industrial plants.

listed on the opposite page. You can order a package substation that exactly fills your functional requirements and forms an integral, *flexible* part of your plant's existing, or planned load center power distribution system. It arrives at your plant complete with steel structure and *all* necessary electric equipment—a fully co-ordinated, ready-to-install unit.

HERE ARE THE TIME-SAVING MONEY-SAVING ADVANTAGES OF G-E PACKAGE SUBSTATIONS

1. Out-of-the-catalog ordering.

There are hundreds of standard G-E package substation combinations. You'll likely find the basic combination that fits your needs in GEA-4500 (described below). It's then surprisingly easy, you'll find, to order a package substation with the functions, ratings, circuits and physical arrangement to exactly match your specific needs. *One specification* and *one order* complete the job—at a fraction of the cost in time and dollars usually required to plan and order the substation in the conventional way.

2. Quick, easy installation.

Your package substation arrives in factory-assembled sections as large as shipping and handling facilities permit. It includes everything you need—right down to complete erection instructions—so that you can put the entire substation on the job quickly, easily, and economically.

3. Flexibility for future needs.

Centralized design of G-E package substations permits exceptional flexibility to meet changing plant power requirements. Capacity can be added—or removed—at little cost and in easily handled "blocks of power" to take care of increased power requirements, load shifts, or relocations.

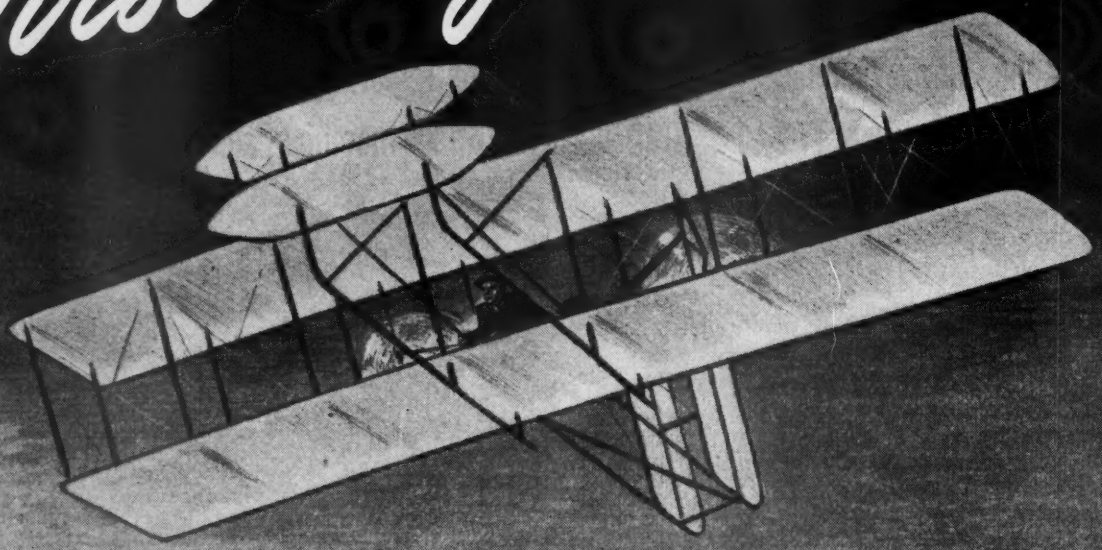
Look into these inherent economies of G.E.'s new package substations, in terms of your next specific application. We believe you'll be pleased with the over-all savings it offers you. General Electric sales representatives will gladly work with you on any substation application you may have in mind. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

Ask for a copy of GEA-4500. This new 78-page bulletin illustrates 30 standard classes of package substations, gives you helpful application information on each and shows you just how each will look installed. Your G-E sales representative can provide a copy or write to Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

***FOR BETTER SCHEDULING OF DELIVERIES*—Consult us early. A package substation matched to your needs can be ordered promptly, saving you months of detailed planning—moving up your delivery schedule.**

GENERAL ELECTRIC

First Flight BY THE WRIGHTS



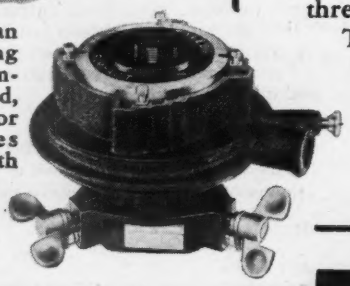
. . . in the early days of

TOLEDO Leadership in Pipe Tools!

It was a dreary December day in 1903 when the Wright Brothers made their momentous flight over the sand flats of North Carolina . . . *the world's first successful airplane flight!*

In the 12 H. P. biplane weighing a total of 750 lbs., Wright stayed in the air 12 seconds. Three more flights were made the same day, the fourth of which covered 852 feet in 59 seconds attaining a speed of 30 M. P. H. Compare this with the advancement made in aviation to today's jet propelled planes traveling 660 M. P. H.

These were the days, too, when TOLEDO Pipe Tools were first being produced. And in their field, these tools soon demonstrated outstanding merit . . . expanding from four basic threaders introduced in 1902 to the wide range of TOLEDO-Engineered Pipe Tools and equipment of today. The Toledo Pipe Threading Machine Company, Toledo, Ohio. New York Office, No. 2 Rector Street Bldg.



Toledo SIMPACT—an example of outstanding design and performance! A self-contained, adjustable threader for 1" to 2" pipe. Sizes changed instantly with one set high speed steel dies. Accurate, dependable.

"TOLEDO" TRADE-MARK REGISTERED

TOLEDO
PRECISION PIPE TOOLS

SERVING THROUGH SCIENCE

FARM OR HOSPITAL

Be Sure to Ask this Question

SMALLEST DIAMETER, LIGHTEST WEIGHT NATURAL RUBBER INSULATED WIRE

- **SAFER** because of perfectly centered conductors.
- **SAFER** because 10 layers of pure rubber insulation guard against current leakage.
- **SAFER** because of special fibrous, flame-resistant cover.

Smaller size permits more circuits in conduit.

U.S. Laytex CONSTRUCTION

RU wiring with RU?

Adequate wiring—for new structures or old—is assured if the specifications read "RU-Laytex".

Electrical wholesalers, architects, engineers and contractors, familiar with this famous product of U. S. Rubber engineering, know from experience that here is the wire for modern electrification.

For RU-Laytex, with its unique insulation of purified natural rubber, is today's lightest weight, smallest diameter, rubber insulated building wire.

Both in physical and electrical properties RU-Laytex leads the field. It prevents current leakage, has greater resistance to climatic deterioration, is easier to install, permits more circuits per conduit.

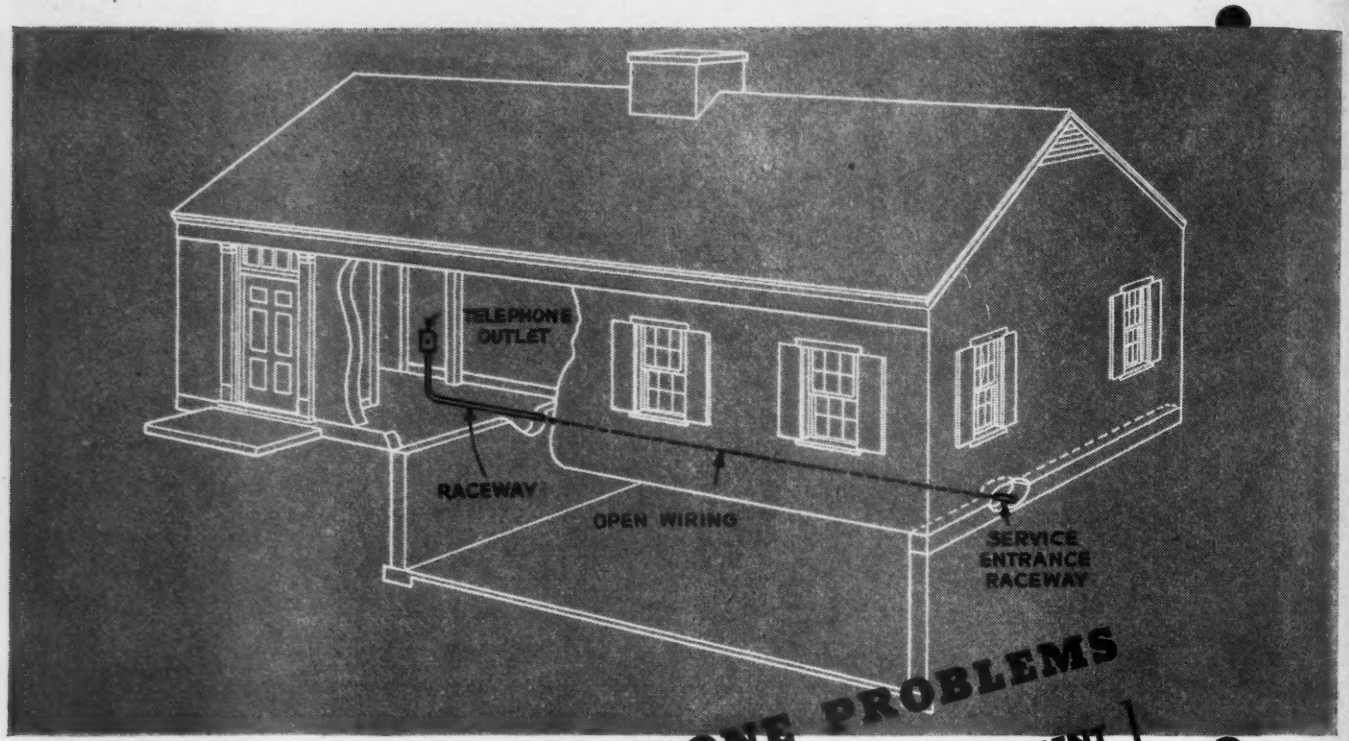
So keep that question in mind: "RU wiring with RU?" The right answer means greater satisfaction for all concerned.

(RU type is approved by the National Electrical Code as a general all-purpose wire.)

UNITED STATES RUBBER COMPANY

1230 AVENUE OF THE AMERICAS • ROCKEFELLER CENTER • NEW YORK 20, N. Y.

EVEN SMALL HOMES SHOULD HAVE RACEWAYS FOR TELEPHONE WIRES



SMALL-HOMES TELEPHONE PROBLEMS

[THE CASE OF THE ONE-STORY HOUSE WITH UNFINISHED BASEMENT]

Every residence job means extra profit for you and extra convenience for the owner if the electrical contract for the new home includes raceways for telephone wires.

The simple telephone wiring arrangement shown above is usually all that is needed in a one-story home with an unfinished basement. A short piece of pipe or other type of raceway is installed within the wall from the basement to a convenient telephone outlet, assuring concealed telephone wiring in the living quarters.

Remember—NO ELECTRICAL CONTRACT IS REALLY COMPLETE UNLESS IT INCLUDES A RACEWAY FOR BUILT-IN TELEPHONE WIRING FACILITIES.

BELL TELEPHONE SYSTEM

"These New Units Put Power Where It's Needed..."

Says Contractor Installing Allis-Chalmers Dry-Type Transformers in Modern Food Plant!

THE BERCUT-RICHARDS PACKING COMPANY, largest individually owned packing plant in California, maintains strictest standards of cleanliness in all of its food handling processes.

An important factor in upholding these standards is the placement of *adequate lighting* over equipment. For this type of all-important load-center service their electrical contractor chose Allis-Chalmers new Class "B" Insulated Dry-Type Transformers which offered such advantages as: 1) ⅓ smaller size; 2) up to 38% lighter; 3) less mounting support needed than with conventional Class A insulated units; 4) valuable savings in secondary wiring and installation time.

Want more details on these *modern* units? See your nearby Allis-Chalmers dealer or sales office, or electrical contractor. Send for Bulletin B6382. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN. A 2120

INDIVIDUAL LIGHTS, placed at work center over equipment, aid in cleaning and packing asparagus in Bercut-Richards' modern food plant.

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment
Biggest of All in Range of Industrial Products

Dry-Type Transformers

IMPORTANT—

..in assuring job dependability!

ACCURATE TAPES

THESE quality tapes — rubber and friction—have *all* the qualities required to reduce job costs and improve job quality. And because they offer the user these important advantages on the job, these quality tapes have acquired a level of trade acceptance which automatically generates faster, more consistent sales in volume . . . sales based on a twenty-five year reputation for dependable uniformity in sticking quality, mechanical and dielectric strength as well as full footage per roll.

While ACCURATE tapes are manufactured to the most exacting standards, under rigid quality control, and from the finest materials procurable, these tapes cost no more than other tapes. Actually they cost less because their better working qualities save time in all phases of installation and repair . . . hence lower job costs. Write for details.

..IMPORTANT, too in advantages that mean a better, faster job!

NON-DETERIORATING

EASE OF APPLICATION

GOOD ADHESION

HIGH TENSILE

DIELECTRIC STRENGTH

EASY TEAR-OFF

PROTECTIVE PACKING

a mc

OVER A QUARTER CENTURY OF TAPE SPECIALIZATION

All of us at HOLDENline—the people in the plant, the men in the field and Dean Holden, Harry Ingraham and Gary Wise—as we wish you a very Merry Christmas—are working harder than ever before to assure you a most prosperous New Year.

We're settled in our big new plant, we've got new products and new production-processes. We want you to know that we've got new plans—plans that will help give you more of the HOLDENline CHAN'L-RUN you want.

Most of all, we want to acknowledge your patience, your forbearance, your faith in HOLDENline in a year of pronounced shortages. We deeply appreciate your loyalty in these troubled times. Your support has made us proud and pleased. We hope that—in the year to come—we can help make yours a brighter and more prosperous New Year!

Ask your Wholesaler for HOLDENline CHAN'L-RUN folder, or write to . .

HOLDENLINE COMPANY

Pioneers in Fluorescent

2301 SCRANTON ROAD • CLEVELAND 13, OHIO

A smart pipe vise and workbench

Easily set up

where you need it

RIDGID

Portable

TRISTAND

● It makes sense that this efficient Tristand, practically a portable workbench, becomes more popular by the month. Hinged legs fold in for easy carrying to the job. It sets up solid against tipping. Ample room on top, slots for tools, a pipe rest and three handy pipe benders . . . remarkably convenient. Comes with chain or yoke pipe vise, LonGrip jaws easy on polished pipe. Strong malleable construction, years of easier pipe work. Ask your Supply House for the RIDGID Tristand.

Tristand made also with yoke vise.

Less Work More Speed

threading 1" to 2" pipe with this No. 1R poster

RIDGID

Has the famous RIDGID quick-setting workholder

● This improved No. 1R gives you pipe threading speed and convenience you're not used to finding in a 1" to 2" poster die stock. Mistake-proof workholder sets to size quickly, only 1 screw to tighten on pipe . . . no bushings to bother with. Direct action threading, no wobble—full-floating posts only taper threads. Fast smooth-threading alloy or high-speed steel dies, rugged steel-and-malleable construction for long use. Popular price—ask your Supply House.

It stands up anywhere on its own feet.

Millions of RIDGID Tools in use

★ RIDGID ★

WORK-SAVER PIPE TOOLS

The Ridge Tool Company
Elyria, Ohio, U. S. A.

WANTED for homes

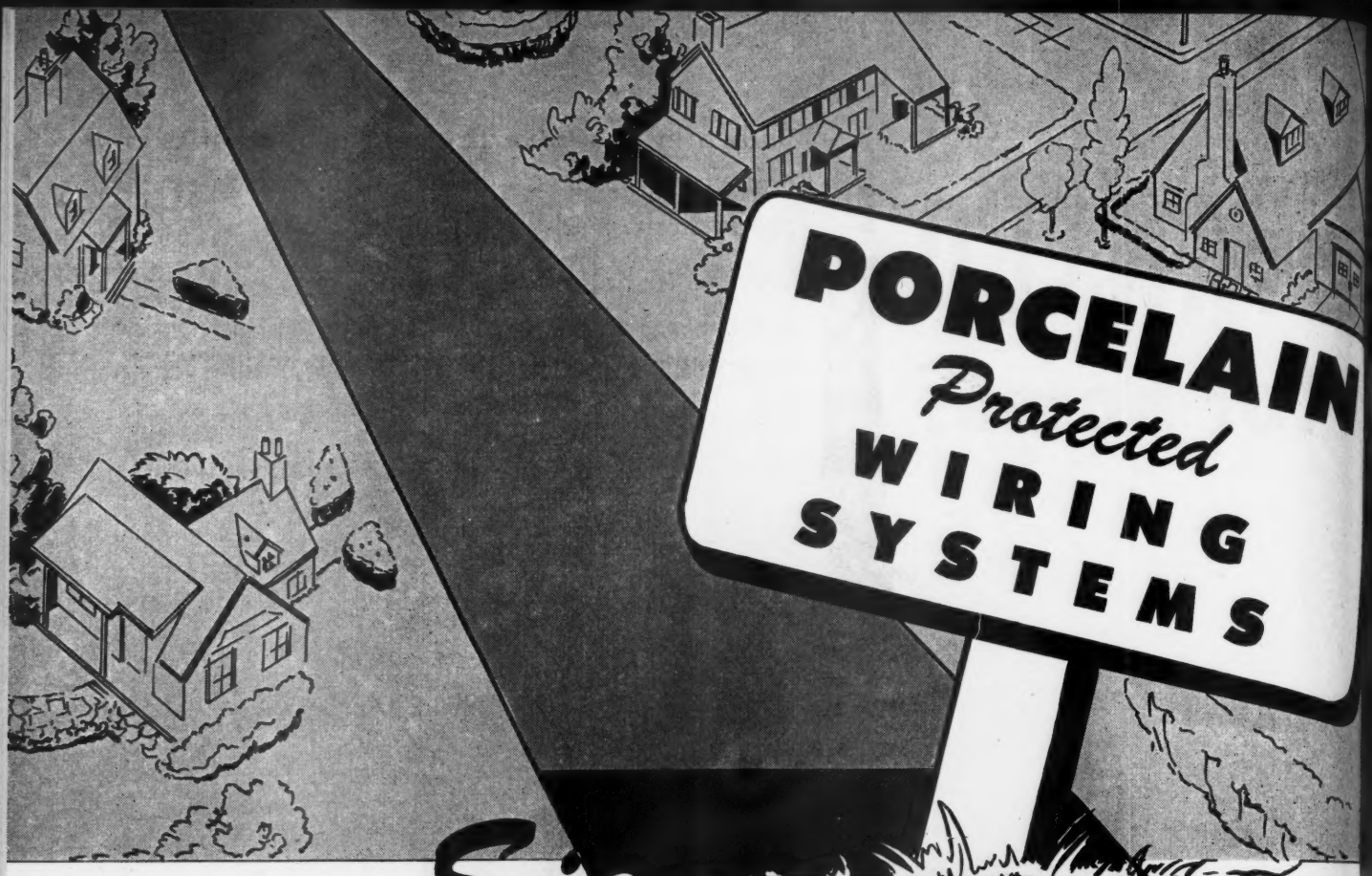
Shown in this advertisement are four fixtures of almost universal usefulness—from the latest Virden productions.

We like to believe that applications for these good fixtures are so clear and practical that every lighting man will see instantly how Virden Values open the door to opportunity everywhere.

Available now. See your Virden jobber.

John C. Virden Company • Cleveland, Ohio

Member American Home Lighting Institute



THE *Sign* OF ADEQUACY SAFETY PERMANENCE FLEXIBILITY ECONOMY *for all* HOUSING PROGRAMS

● Porcelain protective wiring systems have a long and honorable record. They are adaptable to all modern requirements today as they have been for the past fifty years.

Porcelain is your answer to wiring because its usage makes jobs easier to do—most modern wiring is accomplished, and both you and your customers' benefit, through its adequacy—safety—permanence—flexibility and economy. Insist on it for residential, commercial, institutional, and industrial wiring.

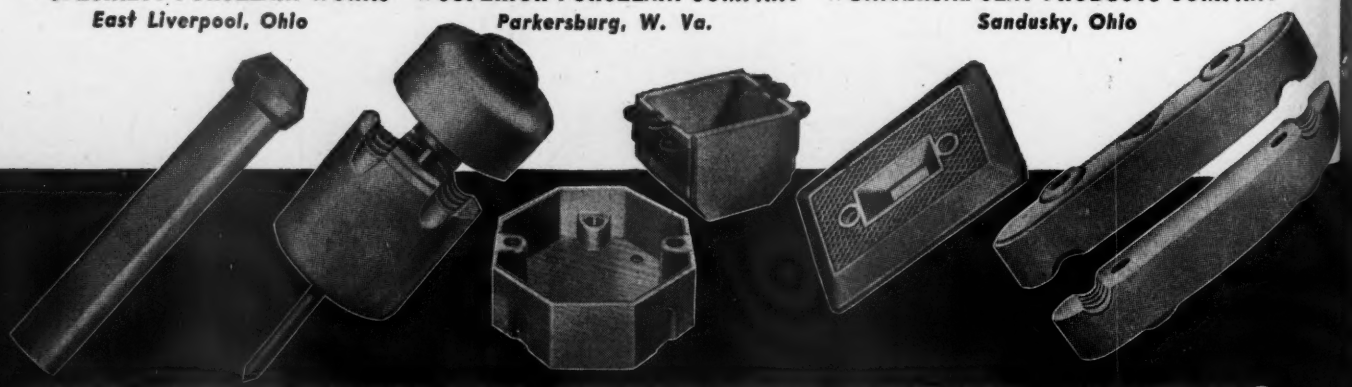
★ **ILLINOIS ELECTRIC PORCELAIN CO.**
Macomb, Ill.

★ **PORCELAIN PRODUCTS, INCORPORATED**
Findlay, Ohio

★ **SPECIALTY PORCELAIN WORKS**
East Liverpool, Ohio

★ **SUPERIOR PORCELAIN COMPANY**
Parkersburg, W. Va.

★ **UNIVERSAL CLAY PRODUCTS COMPANY**
Sandusky, Ohio

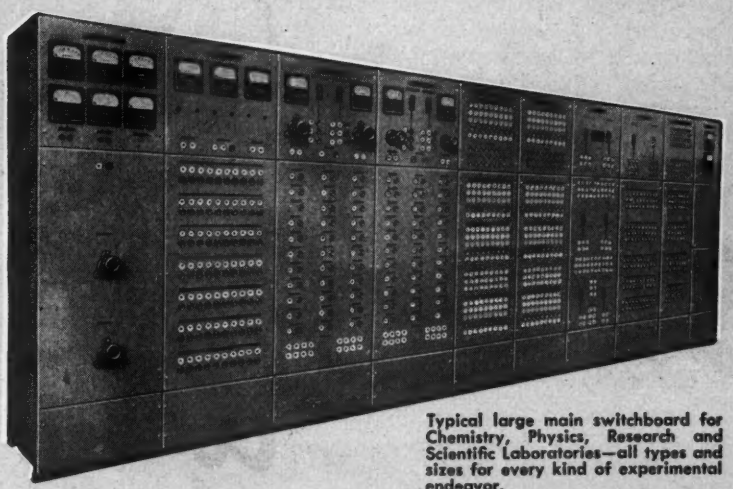


MODERN PORCELAIN PROTECTED WIRING SYSTEMS

EXPERIMENTAL PANEL BOARDS CUSTOM-BUILT BY EXPERIENCE AND SPECIALIZATION...

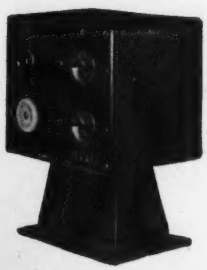
Wurdack Research Laboratory Equipment meets the exacting specifications for school, college, government & commercial laboratories

Wurdack Laboratory Switching and Control Equipment is designed to facilitate scientific research and experimental work in schools and colleges. Electrical energy is extended from the Main Switchboard to classrooms, tables and laboratories.



Typical large main switchboard for Chemistry, Physics, Research and Scientific Laboratories—all types and sizes for every kind of experimental endeavor.

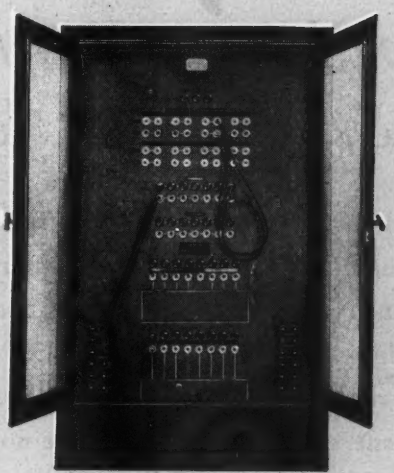
Wurdack Service Outlets



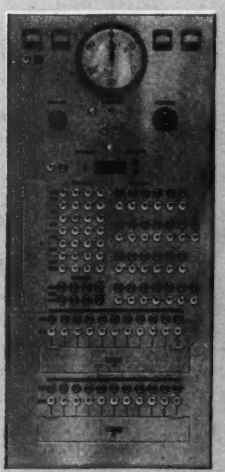
Enclosed service outlets for table or pedestal mounting. Supplied with base to rigidly support outlet and conceal conduits. In various combinations including single and double face.

Flush type service outlets in all types of combinations supplied with recess box of code guage steel for mounting flush in work tables, desks or in walls.

Wurdock Cord Sets, color coded, are supplied with male and female plugs—spade lugs or pin plugs.

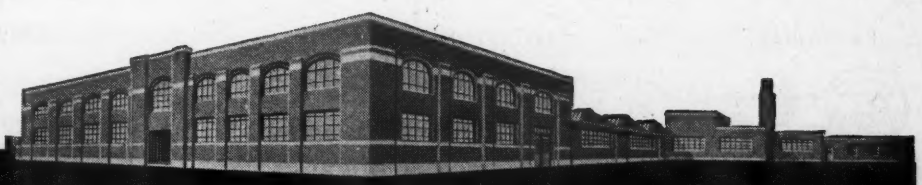


Enclosed type of sub-switchboard installed in College Physics Laboratory.



Laboratory Switchboard with Telechron Timer installed in high school.

Send for the Wurdack Catalog of Experimental Panelboards



WM. WURDACK ELECTRIC MFG. CO.

4444 CLAYTON AVENUE SAINT LOUIS 10, MO.

A Division of Federal Electric Products Company

Okonite backs up your own Adequate Wiring promotion by sponsoring this and other publication messages like it—addressed to architects, planners and specifiers as well as other industry groups interested in extending the effective use of electric power.

Inadequate Wiring Can Keep Your Plant's Electrical System Unfit for Future Growth

NO ENGINEER would send a small boy to do the work of a husky man. Yet some drift into something that's very much like it . . . into letting electrical systems continue to operate with wiring facilities far short of what they should be.

A good program to prevent such drifting is "More power sources and more power at each source." This is a matter of added electrical outlets — *and much more.* It calls for Adequate Wiring in the broadest sense of the term — wiring not only for present needs but planned to take care of future lighting and power requirements at the lowest cost per kilowatt consumed. Many other precautions help you get full electrical efficiency. You can insist on ample copper in conductors. You can use cables of higher voltages and put unit substations at load centers for greater operating economies. You can correct power factor with such apparatus as synchronous motors and capacitors.

The principle of Adequate Wiring can be applied to improving existing buildings electrically or to making sure that in new buildings there will be no costly renovations, no ripping out of floors and walls. In every stage of your program, you'll find it well worth your while to work with an Okonite engineer, who knows electrical transmission and distribution problems and who draws on his company's experience in the manufacture of insulated electrical wires and cables since 1878. The Okonite Company, Passaic, New Jersey.

OKONITE OKONITE SINCE 1878

insulated wires and cables for adequate wiring at its best

4696

For paint spray booths

Westinghouse Type FDT-40 Fluorescent dust-tight and vapor-tight luminaire. Approved for Class II, Group G, hazardous locations.

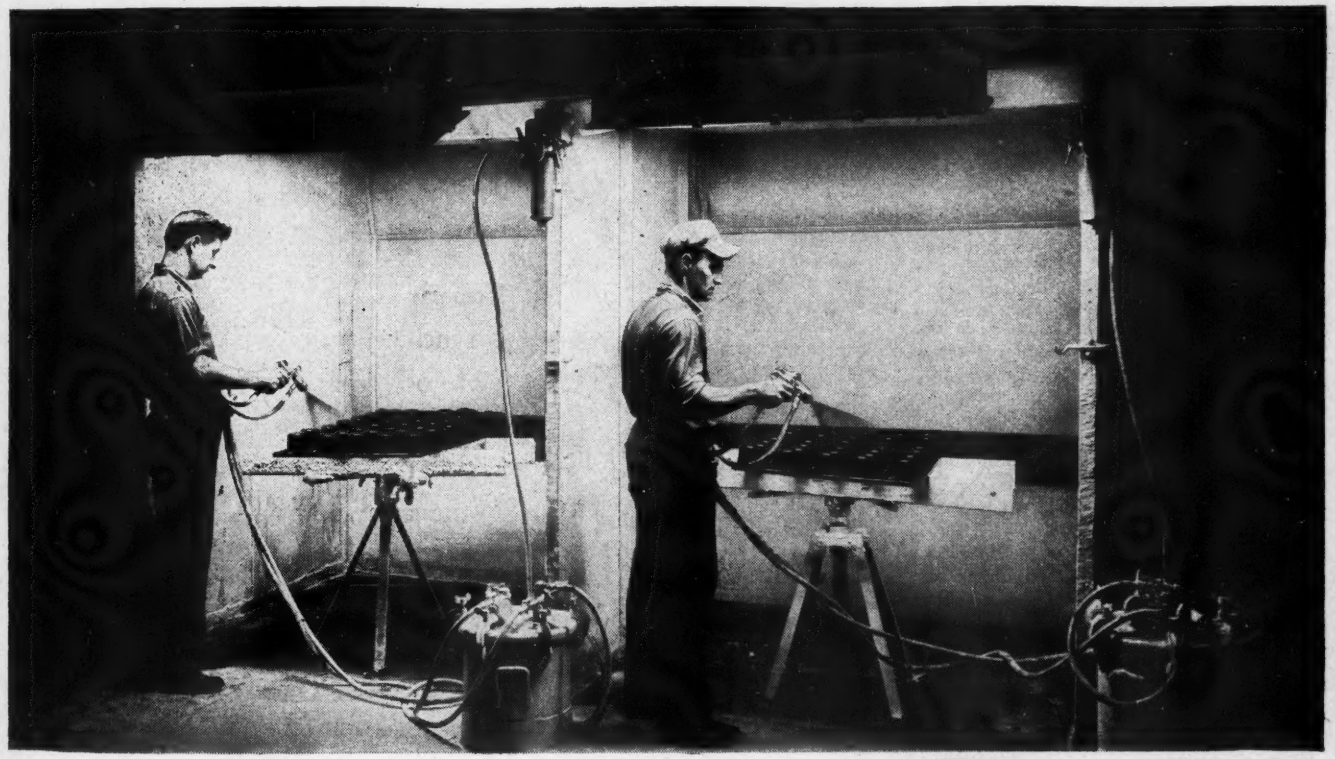
..... *where safe, easy-to-maintain lighting is a must*

Spray booth lighting presents three special problems—all of which must be considered in selecting the *right* lighting unit.

First: the seeing task is often difficult because of poor contrast conditions between the color of paint and the surface on which it is applied. *Second:* most paint materials used contain inflammable solvents, the fumes from which constitute a definite fire hazard. *Third:* the fine paint spray or "dust" collects on exposed lighting equipment, so maintenance is a real problem.

The Type FDT-40 fluorescent luminaire meets these conditions by providing high illumination without glare—by dust-tight and vapor-tight construction, and by ease of maintenance. Paint residue or dust is easily removed from the glass cover.

For application and installation information, ask your nearest Westinghouse distributor for Data Sheet 3312-A. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-04109



Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

PLANNED LIGHTING

AVAILABLE THROUGH 127 WESTINGHOUSE ELECTRIC SUPPLY OFFICES AND INDEPENDENT JOBBERS

IDEAL HOUSE WIRING SPECIALS

"WIRE-NUTS"

For hundreds of various house and other wiring jobs, IDEAL wire connectors provide the modern way to make quick, safe, easy and lasting joints. They are easy to use—you simply (1) strip wires, (2) screw on — that's all! And, you have a wire joint that's better electrically, stronger mechanically. They eliminate the fuss and bother of old fashioned solder-and-tape and blow-torch methods. All you need is a wire stripper and a pocketful of "Wire-Nuts." Made in five sizes for all solid and stranded wire combinations from 2 No. 18 to 3 No. 10. FULLY APPROVED. Millions in use!

FISH TAPE, REEL AND PULLER

No more worry about Fish Tape getting loose and springing all over the floor. With the IDEAL Fish Tape Reel, it is easy to pull tape through conduit quickly. While the coil of steel tape is held securely in the reel at all time, it can be instantly and quickly run out to any length, with constant tension on the wire being maintained—no kinks, bends or breaks.
The Fish Tape, Reel and Puller is three tools in one; belongs in every Electrician's Kit along with pliers, cutters and screw driver. Made in 8 convenient sizes.

B-X ARMOR CUTTER

B-X cable (either two or three wire, No. 12 or No. 14) is easily and quickly cut in one snip with this handy new pocket size tool. The B-X Armor Cutter eliminates antiquated, dangerous hack saw methods. This tool cuts cleanly, without injury to insulation. Has a special steel cutting blade removable for sharpening.

SERVICE ENTRANCE CONNECTORS

Especially efficient for making connections between service drop conductors and house entrance leads. The body is made of cold drawn copper; the screws of Everdur. These service entrance connectors take wire Nos. 2 to 10 stranded, and No. 12 solid. Easily applied with a screw driver or pliers.

"SCREW-TITE" SOLDERLESS LUGS

Can be quickly and securely attached with either screw driver or wrench. "Screw-Tite" Lugs require no solder—no special application tools.
Made of seamless electrolytic copper, accurately pressed for uniform size. Heavy brass, checkproof shell reduces heating. Flat contact surfaces assure minimum resistance, with full carrying capacity evenly distributed from wire to lug. There is no metal cut away to reduce capacity. Made in 8 sizes for No. 14 wire to 2,000,000 CM cable (35 to 1050 amps.) Special "Screw-Tite" Lugs are available.

CABLE RIPPER

Cuts non-metallic sheathed duplex cable or lead covered cable—cleanly, quickly, easily, in one simple operation. Case hardened cutting point provides positive, clean ripping by simply squeezing cable ripper on cable and pulling.
Can also be used for ripping outer sheathing of other cords, lead cables, etc., where outside diameters is not greater than ⅝". Overall length 3¾" — weight 2 ounces.

WIRE AND CABLE REEL

Easily hangs anywhere—from joist, pipe beam or wherever it is handy, giving the workman complete control of coiled wire or cable. Steel frame is designed with one part of the frame smaller than the other, so that when Reel is folded it requires no more room than an ordinary coat hanger. A finger locking device holds Reel open or closed. Handles practically any type of coil from 3" to 14" inside diameter, insulated wire from No. 18 to No. 2, electrical cord, rope, armored cable, romex, binding, etc.

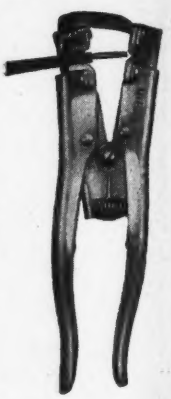
SPLIT BOLT CONNECTORS

These new IDEAL Split Bolt Connectors are made of either high quality bronze, brass or aluminum. They have precision contact surfaces, to produce maximum conductivity. They are used for permanent or temporary solderless connections.
Available in Two Types—"one piece" and "two piece" with small or large heads. On the "one piece" type a flexible link permits universal movement of the nut. The nut swings entirely clear of the slot, eliminating interference with wires during installation.

JOIST BORING MACHINE

No more climbing up and down ladders, no more back breaking stooping or straining. This IDEAL Joist Boring Machine bores through rafters, joist or studding up to height of 11 feet or bores below floor level. Bit locks into position with a knurled collar. Weight 11 lbs. The joist borer is now available "knocked down" without pipe, to assemble on the job. Either standard ½" pipe or conduit can be used.

"E-Z" WIRE STRIPPERS



Here is a handy wire stripper. Pocket size, only 7½ inches long—weight 24 ounces. "E-Z" Wire Strippers come in 2 models. "Automatic" and "Standard."
Operating on the triple action principle, the "Automatic" model clamps the wire, cuts insulation and strips it, all in one simple operation. A lever stops the return of the arms until the wire is removed, after stripping. Strips stranded wire but can be used equally well on solid wire.
"Standard" Model does not have "return lever." It is particularly suited for stripping solid wire, but can be used for stranded wire. Five sizes strip No. 30 to 8 gauge—solid or stranded wire.

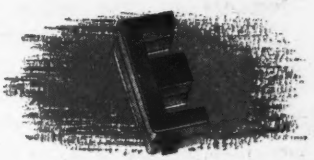
SOLD THROUGH ELECTRICAL WHOLESALERS

IDEAL INDUSTRIES, Inc.

Successor to Ideal Commutator Dresser Co.

1041 PARK AVENUE **SYCAMORE, ILLINOIS**

There's nothing puzzling about the huge, ever growing number of important installations that include FEDERAL NOARK controls. They're "part of the picture" of modern industry, fitting closely into plans that call for absolute dependability at every point. Write for your copy of the Federalog, containing complete specifications on FEDERAL NOARK Electric Products . . . Federal Electric Products Company, Executive Offices: 50 Paris Street, Newark, N. J. Plants: Hartford, Conn., Newark, N. J., St. Louis, Mo., Long Island City, N. Y.



E . . . AS IN "EFFICIENT"!

The magnets used in FEDERAL NOARK Controls are E-shaped and proportioned to give a strong pull with very low power consumption another feature that typifies the inbuilt quality of all FEDERAL NOARK Electric Products.

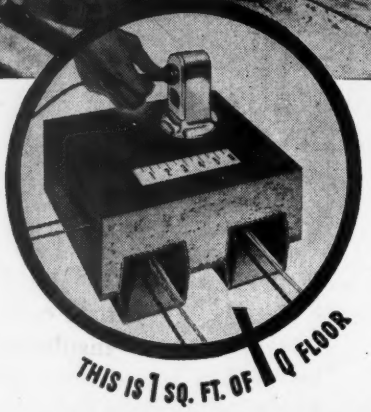
Federal NOARK

INDUSTRIAL CONTROLS

FEDERAL ELECTRIC PRODUCTS COMPANY, MANUFACTURERS OF A COMPLETE LINE OF ELECTRICAL PRODUCTS INCLUDING: MOTOR CONTROLS, SAFETY SWITCHES, CIRCUIT BREAKERS, SERVICE EQUIPMENT, PANELBOARDS AND SWITCHBOARDS

HERE IS THE BEGINNING

of a lot of Repeat Business



The first wiring of a Q-Floor is only the first of a repeating series. Q-Floors are designed to urge tenants to use more and more electricity. Q-Floors encourage continuous electrical change.

Any building must meet electrical development in order to stay modern. Q-Floor is sold in recognition of this principle. The building owner makes a point to his tenants that floor layouts can be, and may be, continuously rearranged to take advantage of new electrical developments. The cost of keeping electricians busy over the years is less expensive, in terms of building income, than the loss of revenue that follows electrical obsolescence.

Any type of wiring may be used with Q-Floor, as has been recognized by the approval from Underwriters' Laboratories, Inc., in accordance with article 356 of the National Electrical Code.

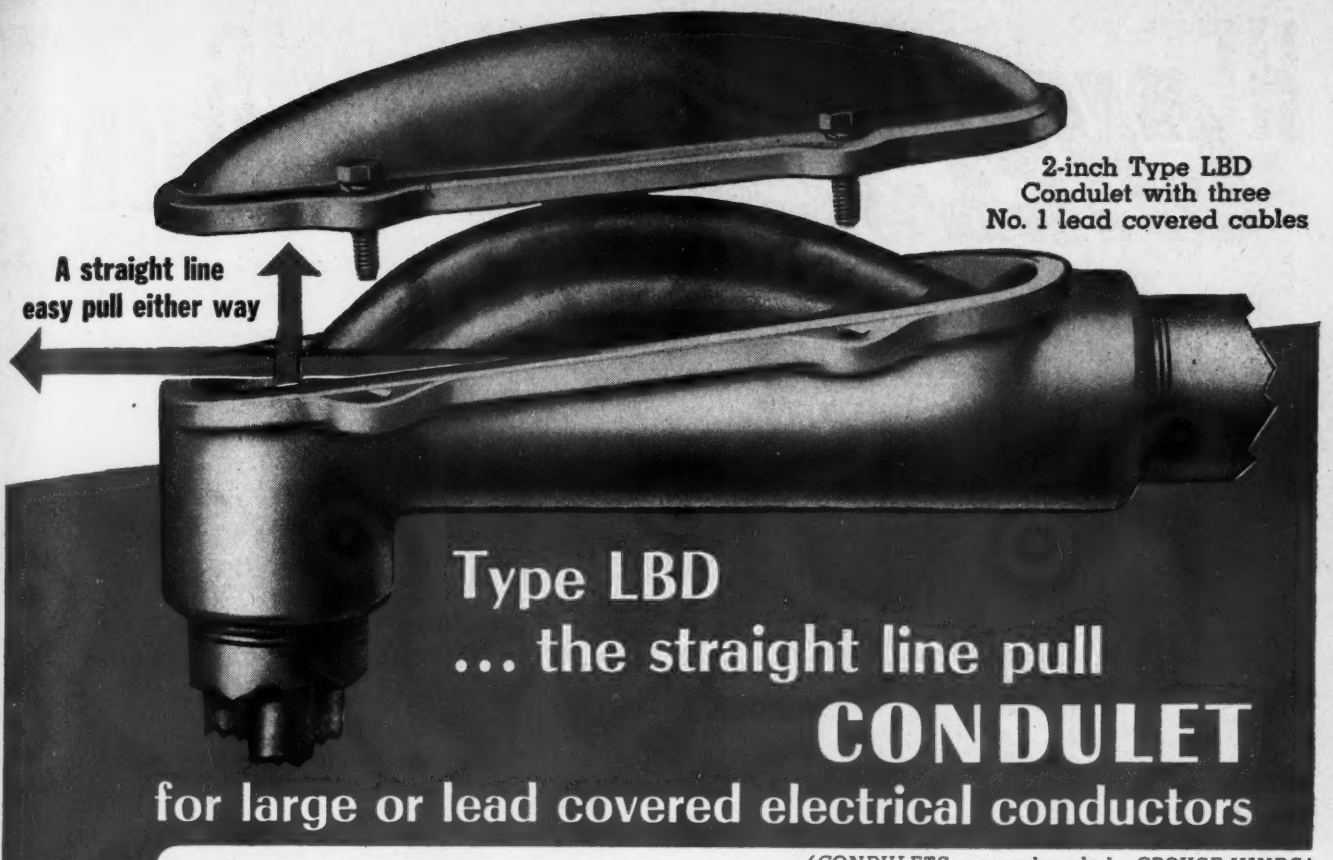
H. H. ROBERTSON COMPANY

2400 Farmers Bank Building, Pittsburgh 22, Pennsylvania

Offices in 50 Principal Cities World-Wide Building Service

Electrical Fittings for use with Robertson Q-Floors can be obtained from General Electric Construction Materials Distributors. See the nearest G. E. Merchandise Distributor for information on how Q-Floor fittings can be used to attain up-to-the-minute electrical wiring.

Q-FLOORS AND ELECTRICIANS ARE PARTNERS
in the business of keeping buildings young



2-inch Type LBD
Condulet with three
No. 1 lead covered cables

Type LBD
... the straight line pull
CONDULET
for large or lead covered electrical conductors

(CONDULETS are made only by CROUSE-HINDS)

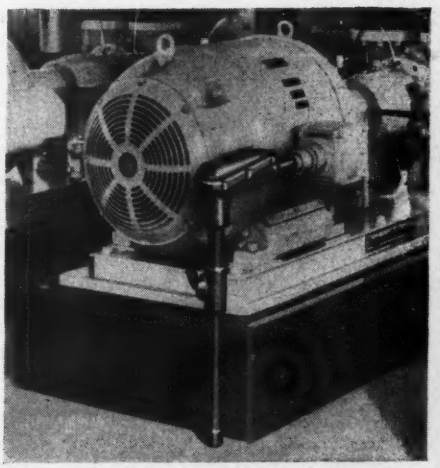
A straight line pull through EITHER hub. Saves time.

Unobstructed pulling space. Easy to manipulate conductors.

Domed cover. Provides extra space to prevent sharp bends that are likely to injure the conductor insulation or sheath.

All sizes. For electrical conduit from ½-inch up to 6-inch.

An Explosion-Proof type is available. Type LBH in sizes from ½-inch up to 3-inch.



A Nationwide Distribution Through Electrical Wholesalers

CONDULETS . . . first in the field and the finest

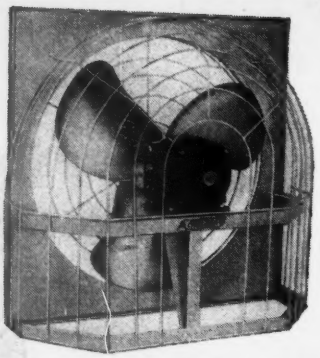
CROUSE-HINDS COMPANY
Syracuse 1, N. Y., U.S.A.

Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Kansas City — Los Angeles — Milwaukee — Minneapolis — New York Philadelphia — Pittsburgh — Portland, Ore. — San Francisco — Seattle — St. Louis — Washington. *Resident Sales Engineers:* Albany — Atlanta — Charlotte — Indianapolis — New Orleans
CROUSE-HINDS COMPANY OF CANADA, LTD., *Main Office and Plant:* TORONTO, ONT.

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

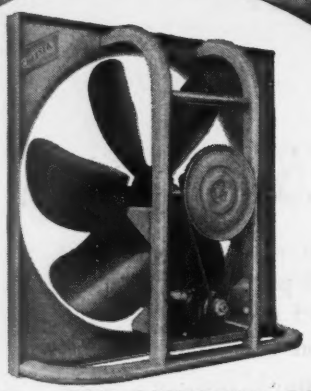
CHELSEA FANS & BLOWERS

...provide clean, fresh circulated air...



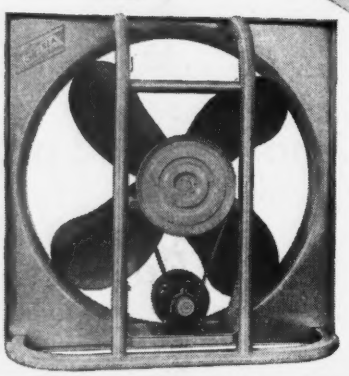
TYPE AA — FOR FOOD FREEZER, MEAT PACKING & STORAGE PLANTS

High air moving capacities . . . Dependable, economical, ball bearing, totally enclosed motors . . . Ratings up to 4800 CFM . . . Front and rear guarded.



TYPE IND — FOR FACTORIES, LOFTS, SPORTS ARENAS, LARGE AREAS

Heavy duty ventilators for air blast action . . . Rugged construction . . . High efficiency ratings to operate against static pressures. Ball bearing motors and drives.



TYPE ED — FOR HOMES, SCHOOLS, CHURCHES, HOSPITALS, INSTITUTIONS

Quiet operation combined with high air deliveries . . . Rugged, streamlined construction . . . Rubber cushioned against vibration. Low power consumption.

Winter or summer, Chelsea ventilating units help make the day's activity more comfortable, more healthful, more profitable. User acceptance of these efficient air movers is a direct result of Chelsea design and range of models . . . a fitness for the job that makes every Chelsea fan deliver extra measures of satisfactory operation. Featured in most models are rugged, all-steel construction . . . dynamically balanced blades . . . efficient, cool-running motors and drives . . . rubber cushioned moving parts . . . Get the details on the Chelsea line NOW. Chelsea fans are in great demand; early orders mean early deliveries!

...wherever people live, work, play or gather!

CHELSEA PRODUCTS · INC.

FACTORIES: COIT, GROVE & OLSEN STS., IRVINGTON, NEW JERSEY

Back again!

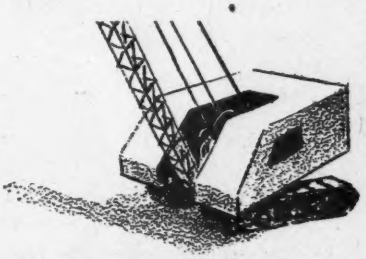
...the BIG 10-ROLL CAN *of the* BEST BUY IN TAPE!

Better way to buy tape, for regular users, is this handy 5 pound can, holding ten 8 oz. rolls of Gold Seal. Off the market during the war, it is now back again on your dealers' shelves.

The sturdy fiber can, with metal top and base, not only protects the tape, but serves as a handy container for small items like nails, screws, and nuts when empty.

Every roll of Gold Seal Tape in the can is cellophane-wrapped and sealed to stay factory-fresh until you are ready to use it.

Whether you buy the can or single rolls, you'll find Gold Seal Tape always just right in "tack", clean handling, non-raveling, non-peeling. Try it . . . you'll agree it's the best buy in tape! Jenkins Bros. (Rubber Div.), 80 White St., New York 13, N. Y.



Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet ASTM and Federal Specifications

JENKINS *Gold Seal Tapes*

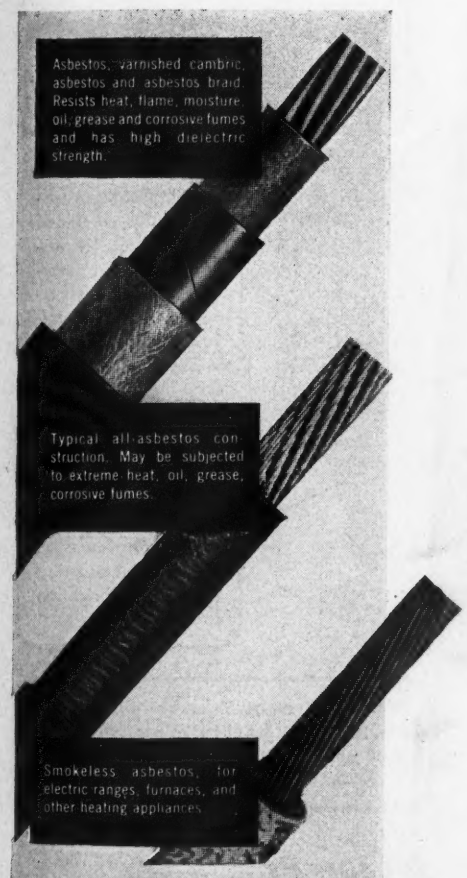
FRICTION and RUBBER TAPES

MADE BY JENKINS BROS. MAKERS OF FAMOUS JENKINS VALVES

Exposure to heat that melts iron

doesn't affect U·S·S Amerbestos Cables

They're built to stand up indefinitely . . . to deliver full power with minimum losses on any installation involving extreme heat, corrosive fumes, moisture, oil, and grease


Asbestos, varnished cambric, asbestos and asbestos braid. Resists heat, flame, moisture, oil, grease and corrosive fumes and has high dielectric strength.
Typical all-asbestos construction. May be subjected to extreme heat, oil, grease, corrosive fumes.
Smokeless asbestos, for electric ranges, furnaces, and other heating appliances.

OTHER U·S·S AMERICAN ELECTRICAL WIRE AND CABLE PRODUCTS

- ★ New PS Conducting Rubber Shielded Wire and Cable.
- ★ Ampyrol — Synthetic-insulated wire and cable for switchboards and machine tools.
- ★ Amerclad—Tough abrasion resisting cable for portable tools, motor leads, power cable.

THAT's why you'll find U·S·S Amerbestos Cable in steel mills, foundries, glass works, kilns, boiler rooms, locomotives, ships, and other installations where ordinary cables would quickly fail.

Amerbestos Wire and Cable of all types are insulated with felted asbestos which is spun right on the copper conductor. It's then impregnated with flame-proof insulating compound and compressed into a firm, uniform insulating sheath. This sheath is seamless . . . will not unravel or disintegrate . . . yet can be easily and cleanly stripped away from the conductor.

When more dielectric strength is needed, a layer of heat-resisting varnished cambric and a second layer of felted asbestos are added. Where resistance to moisture, oil, and grease is needed, the cable is impregnated with MFH black saturant.

So, when you need electrical wire and cable of this *or any other kind*, get in touch with us. We probably have just what you need in standard types . . . or can make exactly what you require to your own specifications.

LISTEN TO . . . *The Theatre Guild on the Air*, presented every Sunday evening by United States Steel. American Broadcasting Company, coast-to-coast network. Consult your newspaper for time and station.

AMERICAN STEEL & WIRE COMPANY · USS · AMERICAN ELECTRICAL WIRE AND CABLE · UNITED STATES STEEL

American Steel & Wire Company
Cleveland, Chicago & New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York

UNITED STATES STEEL

U·S·S Amerbestos Wire and Cable

WAGNER Repulsion-Start Induction Motors Are Long-Lived, Economical, and Dependable

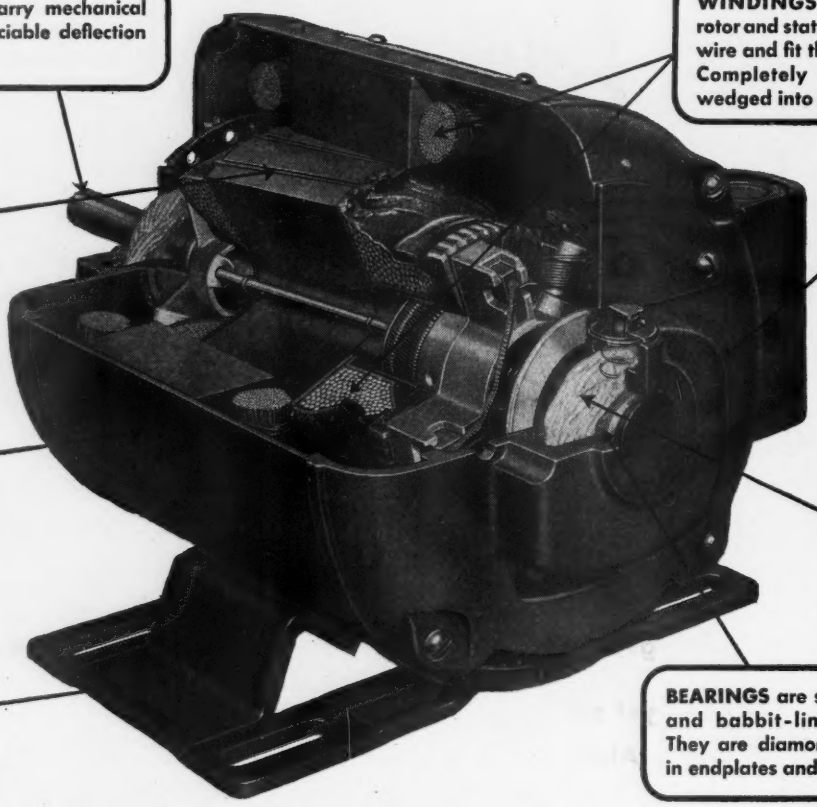
Wagner type RA repulsion-start induction motors give years of reliable, trouble-free service, because dependability is built into every motor.

Careful engineering has reduced wear, vibration, and noise of operation to a minimum. Many important construction features such as sturdy welded steel frames and well-insulated windings securely held in place, add to the ruggedness of the motors without sacrificing compactness or efficiency.

Wagner type RA motors embody all the important improvements in single-phase motor design. This means that the user of RA motors gets the best motors for the job with long life and dependability built into every part.

Type RA motors are available in ⅛ to 15 hp; sleeve or ball-bearing; horizontal or vertical; open, drip-proof, and totally enclosed; rigid, resilient, or flange mountings.

A few of the many Wagner construction features are shown below around a cut-away view of the type RA. For complete description of Type RA motors, write for Bulletin MU-185, and address your inquiry to Wagner Electric Corporation, 6413 Plymouth Avenue, St. Louis 14, Mo.



SHAFT is designed to carry mechanical overloads without appreciable deflection or vibration.

SLOTS in rotor are skewed to reduce magnetic noise and variation in starting-torque.

FRAME—Motor frame is formed from heavy sheet steel. Electrically welded to form a strong, rigid frame which withstands a considerable amount of abuse.

BASE is punched and formed from steel plate—unbreakable. Mounting slots permit shifting of motor for belt tightening.

WINDINGS—The windings of both rotor and stator are of heavily-insulated wire and fit the slots without crowding. Completely insulated and securely wedged into place.

ENDPLATES are concentrically machined and closely fit machined frames, assuring accurate centering of rotor and uniform airgap.

LUBRICATION—Long-strand wool yarn is used in all fractional-horsepower motors. Oil-wells are roomy and the yarn supplies plenty of oil, assuring adequate lubrication at all times.

BEARINGS are steel-backed for strength and babbit-lined to minimize wear. They are diamond bored after assembly in endplates and have a mirror-like finish.

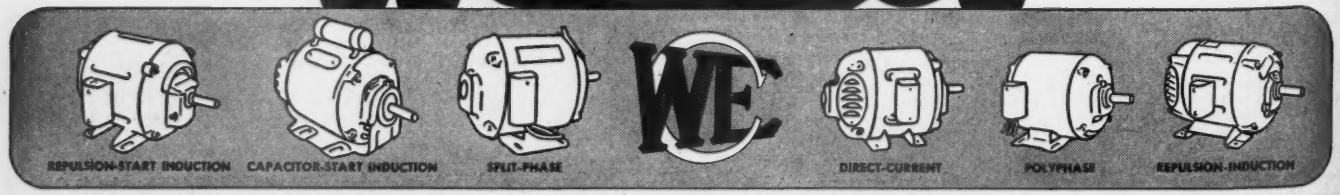
M46-12

Consult Wagner Engineers on all Electric Motor Problems

Electric Motors • Air Brakes • Brake Lining Hydraulic Brakes

Wagner

Transformers • Industrial Braking Systems NoRoL • Tachograph



Sales and Service Branches: ATLANTA 3 • BALTIMORE 18 • BOSTON 15 • BUFFALO 8 • CHICAGO 16 • CINCINNATI 10 • CLEVELAND 15 • DALLAS 1 • DENVER 2 • DETROIT 2 HOUSTON 2 • INDIANAPOLIS 4 • KANSAS CITY 8 • LOS ANGELES 15 • MEMPHIS 3 • MILWAUKEE 2 • MINNEAPOLIS 4 • NEW YORK 7 • OMAHA 2 • PHILADELPHIA 8 • PITTSBURGH 13 • PORTLAND 9 • ST. LOUIS 3 • SALT LAKE CITY 1 • SAN FRANCISCO 3 • SEATTLE 4 • SYRACUSE 2 • TULSA 3 • WASHINGTON 5 • *In Canada:* WAGNER ELECTRIC AT LEASIDE, ONTARIO—*Wagner motor parts are available at 350 Wagner-owned and -contract repair shops.*

LESS MOUNTING SPACE REQUIRED

—MORE SPLICING ROOM

with KILLARK ELECTROLETS

You can run those lines in tight spots with Killark Electrolets. Compact oval or oblong types for those many jobs where space is limited—on columns, in troughs, etc.

There's plenty of room for splices and solderless connectors —and there's a full opening with no lugs to get in your way.

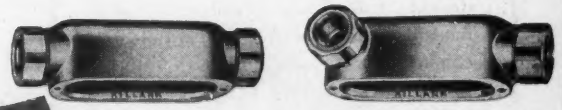
Killark Electrolets are light-weight, yet sturdy and non-shatterable because they're tough. Aluminum sprayed for fine finish.

Every Killark wholesaler features Electrolets—Order from your Killark Catalog.

Many types of covers are available for Electrolets: Blank covers, insulator covers, switches, receptacles, hangers, etc.

"O" (oval) Electrolets are furnished in a wide variety of shapes and hub combinations for threaded and threadless heavy wall conduit and thinwall conduit.

Electrolets are available also in the popular "L" (oblong) series—with all types of covers.



KILLARK — ST. LOUIS

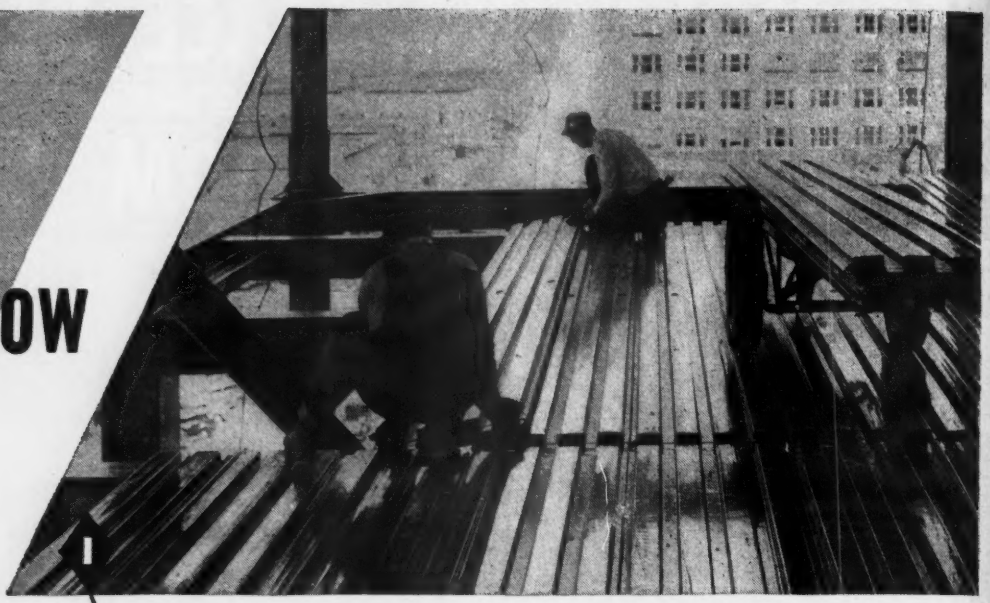
Killark ELECTRIC MANUFACTURING COMPANY

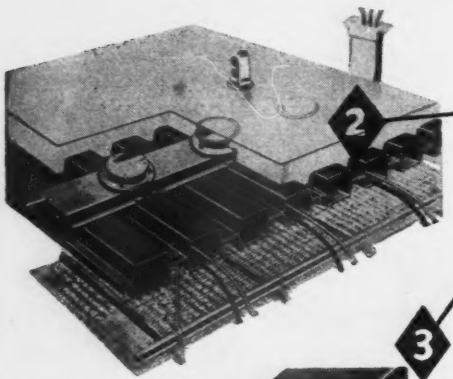
Offices and Warehouses: Atlanta, Baltimore, Boston, Chicago, Denver, Los Angeles, Pittsburgh, San Francisco, Seattle and Syracuse. Offices: Cincinnati, Cleveland, Dallas, Detroit, Kansas City, Minneapolis, New

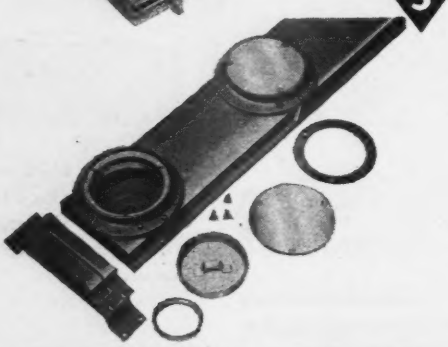
Vandeventer & Easton Ave.

SAINT LOUIS 13, MO.

Do you know these 3 important facts?







1. **Robertson Q-Floors are the starting point for wiring that's *fully* adequate**
2. **Q-Floor wiring is the *only* way to make the job complete**
3. **Only *General Electric* sells Q-Floor wiring**

It will pay you to remember these important facts whenever you consider the electrical needs of your customers. The cellular steel members of Robertson Q-Floors make ideal permanent raceways for completely flexible and adequate electrical systems. Patented G-E Q-Floor wiring is the only material used to install electrical services in Q-Floors. The combination of these two structural and electrical systems results in an extremely simple and flexible method of supplying the electrical requirements of office buildings, banks, hospitals, industrial plants, and other construction requiring a number of services and 100 per-cent electrical availability.

G-E Q-Floor wiring consists of easily installed header ducts with floor cells located on six-inch centers, thus permitting the use of outlets anywhere in the floor every six inches.

New power, signal and telephone connections can be added at will throughout the life of the building.

Before starting any job involving raceways, building wire or wiring devices, ask your nearest G-E Merchandise Distributor for information on the complete G-E line, or write to Section C9-118, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

For Wood and Concrete Floors

G-E Fiberduct underfloor raceways provide full electrical adequacy and flexibility when masonry or wood-type construction is used. Outlets can be preset at the factory or can be added later at any time.

GENERAL ELECTRIC

I always use "Central Conduit"

I figure a company which has such a good and long-standing reputation surely knows its business.

"There's Tested Strength in Every Length"

CENTRAL
RIGID STEEL
CONDUIT

SPANG-CHALFANT

Division of The National Supply Company

General Sales Office: Grant Building, Pittsburgh 30, Pa.

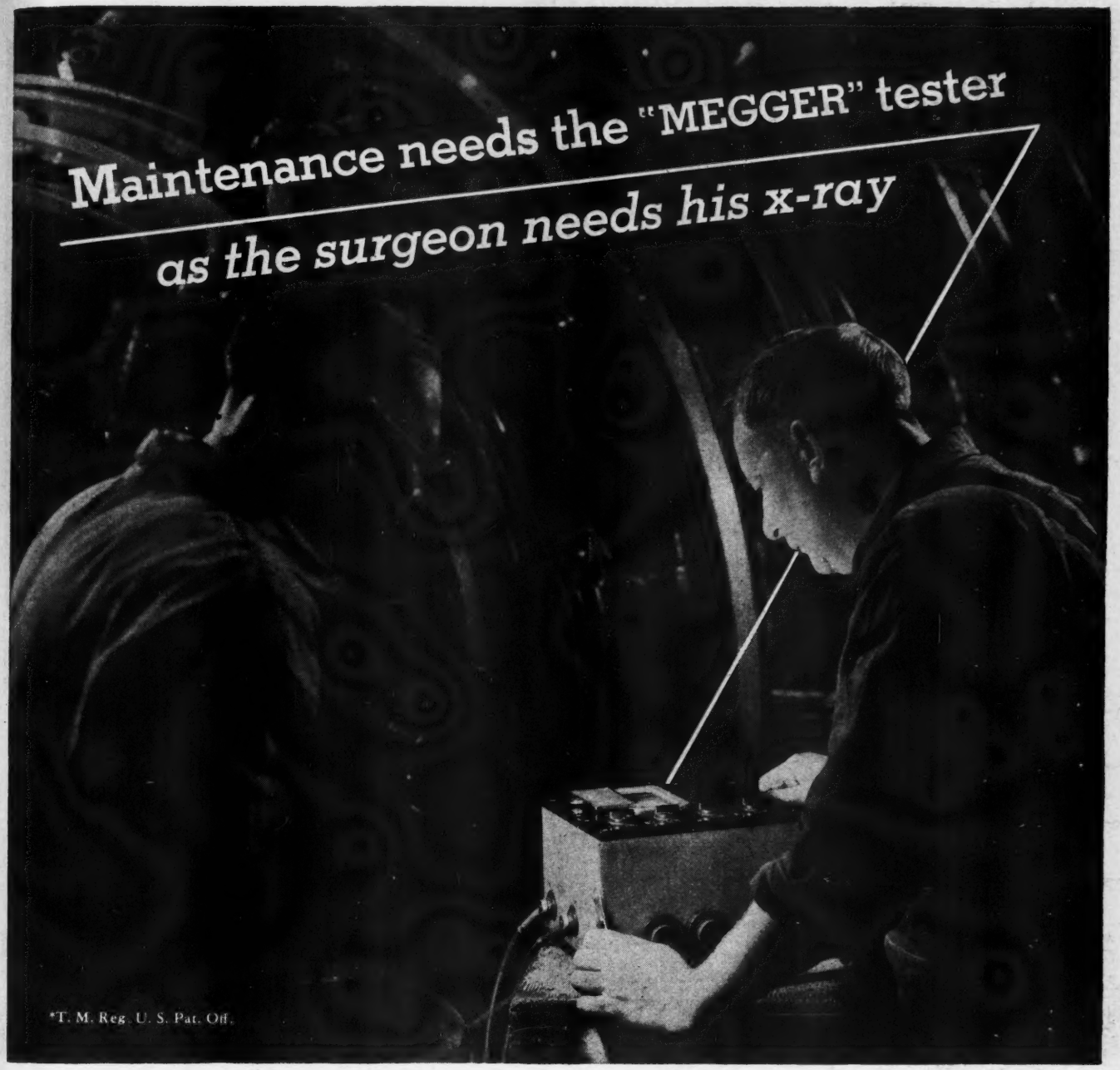
District Offices and Sales Representatives in Principal Cities

—But not bothered

The switch mechanism in the new Cutler-Hammer line of safety switches is designed to withstand safely any degree of heat that can be expected from correctly selected fuses.

In addition, C-H safety switches provide greater ease of installation, greater convenience of operation, proved performance, smart styling . . . more reasons why more and more alert contractors and Cutler-Hammer wholesalers from coast to coast feature and recommend this outstanding line of safety switches. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee 1, Wisconsin.

CUTLER-HAMMER
SAFETY SWITCHES
C-H



Here's what the chief engineer of a large sugar refinery—using its own generators and over a thousand motors from ¼ to 150 HP—has to say about "Megger" Insulation Testers:

"Every Saturday . . . the Wizard (Chief Electrician) applies our 'Megger' Tester to all of our important generating equipment. Usually nothing happens. . . . Then one day the 'Megger' test indicates a leak. . . . Like the surgeon's X-ray the 'Megger' test detects the condition, and a failure is forestalled. With our insulation resistance records we further watch any progressive weakening of the 'arteries' and have warning that permits us to make repairs at convenient times. . . . A maintenance gang without a 'Megger' tester would be like a surgeon without an X-ray machine."

Are you getting the benefit of this kind of insurance protection for the important electrical equipment in your plant? "Megger" Insulation Testers are available in various types (including the unique "Bridge-Meg" instrument here illustrated) with ratings up to 10,000 megohms and 2500 volts d-c. Write today for descriptive, illustrated Catalog 1685-EC.

The photograph and the quotation in this advertisement are used by courtesy of the Pennsylvania Sugar Company of Philadelphia, and Dan Gutleben, who until recently was Chief Electrical Engineer.

James G. **BIDDLE CO.**
ELECTRICAL & SCIENTIFIC INSTRUMENTS
1316 ARCH STREET • PHILADELPHIA 7, PENNA.

"MEGGER"* INSULATION RESISTANCE TESTERS

THE CABLE THAT GIVES YOU

More Service Per Foot

Installment-plan buying won't give you the most for your money in wire and cable. A low price per foot may look attractive, but if you have to repeat the purchase again and again because it failed to stand up under severe operating conditions you are pyramiding the cost and piling a lot of installation expense on top of it. Add service interruptions, lost production and shutdown possibilities to that and you have something worth thinking about.

If you want to keep your circuits functioning on an economical basis check up on how long they are lasting around boilers, furnaces, kilns, soaking pits, and in power plants, steam tunnels, pump rooms or other hot-spots. Find out how often they have to be replaced and plan to re-wire the maintenance-boosters with *permanently insulated* Rockbestos A.V.C. wires, cables, cords that are designed to operate *continuously* at 230°F., without baking brittle, cracking or flowing.

For wire and cable that gives you *more service per foot* specify Rockbestos-developed National Electrical Code types in Rockbestos A.V.C. and All-Asbestos constructions. 125 different types to select from in 300 to 5000 volt ratings for power, lighting and control circuits. For recommendations or a catalog write to:

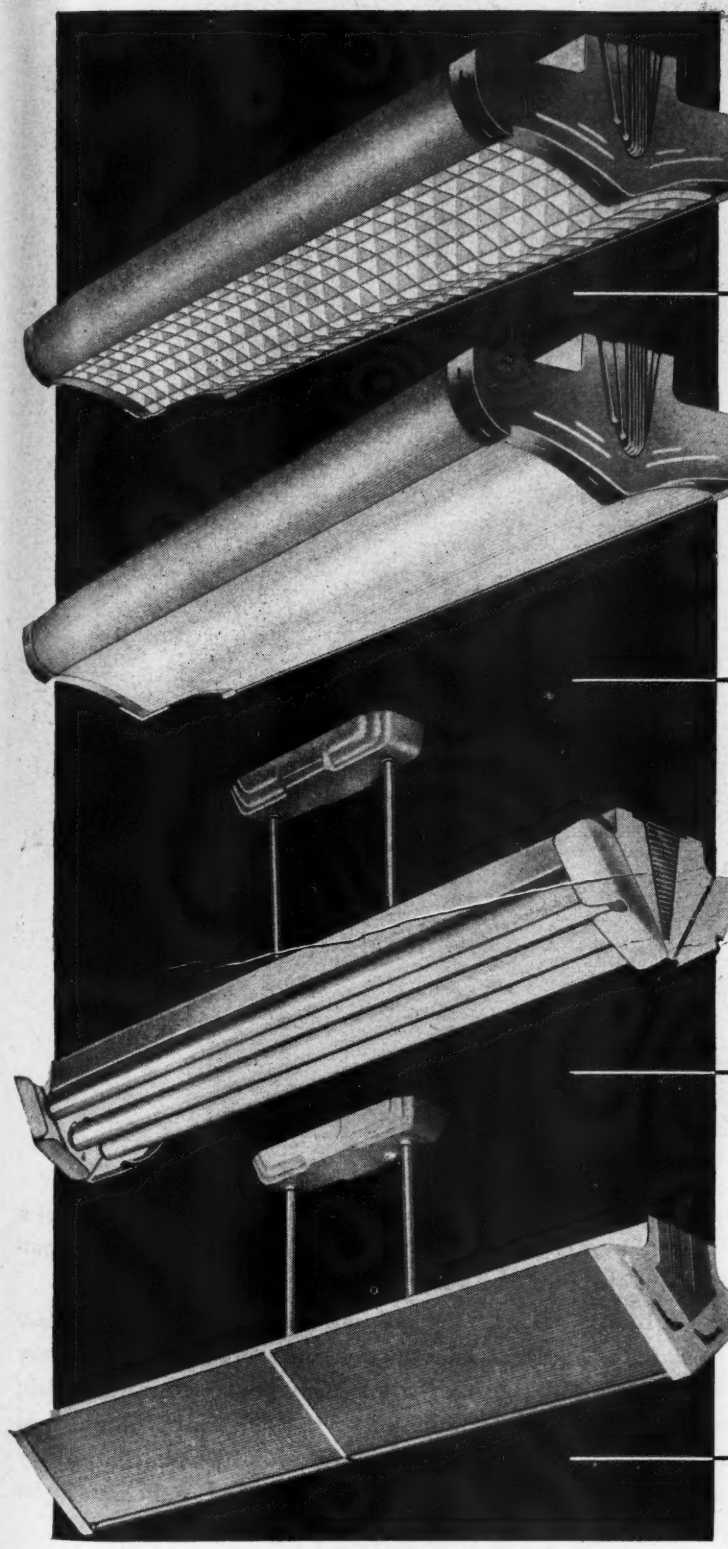
ROCKBESTOS PRODUCTS CORPORATION
206 Nicoll St., New Haven 4, Conn.

ROCKBESTOS A.V.C.

The Wire with Permanent Insulation

The cable illustrated above, Type AVA Rockbestos A. V. C. Power Cable, is one of 125 different permanently insulated wires, cables and cords designed by Rockbestos to meet severe or unusual operating conditions.

NEW YORK BUFFALO CLEVELAND CHICAGO PITTSBURGH ST. LOUIS LOS ANGELES SAN FRANCISCO SEATTLE PORTLAND, ORE.



Constellation-louver

Constellation-glass

Zodiac

Lite-a-nite

LPI

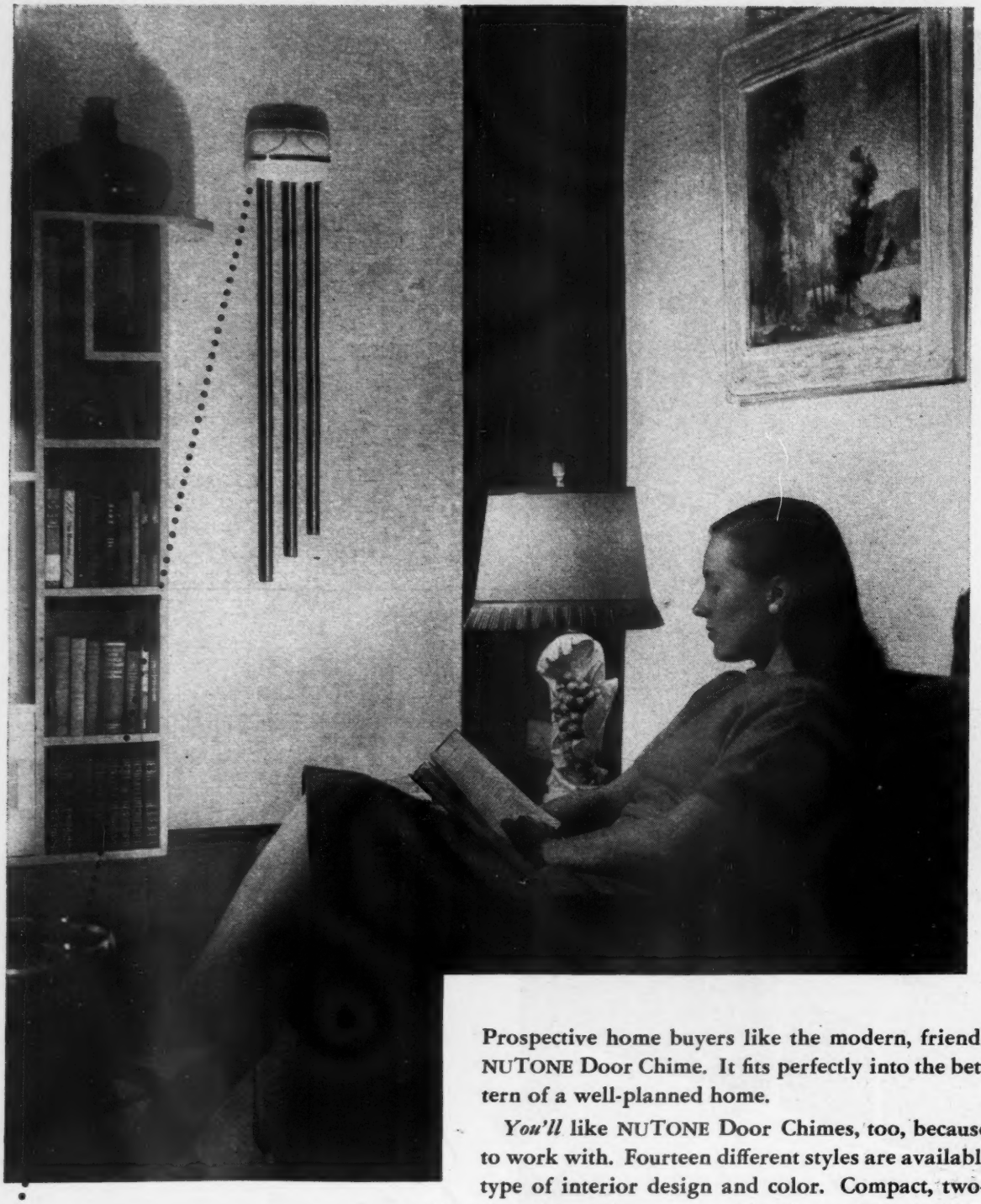
Commercial Fluorescents by Lighting Products combine unusual beauty and practicability with exceedingly high lighting efficiency.

This complete line, with a fixture for every commercial need will more than meet your customers most rigid requirements.

For complete information, send for the following Bulletins—No. 400—Constellation Louvered, No. 410—Constellation-Glass, No. 390—Zodiac and No. 380—Lite-a-nite.

LIGHTING PRODUCTS INCORPORATED

Highland Park, Illinois



in tune with the times . . .

Prospective home buyers like the modern, friendly sound of a NUTONE Door Chime. It fits perfectly into the better-living pattern of a well-planned home.

You'll like NUTONE Door Chimes, too, because they're easy to work with. Fourteen different styles are available to suit every type of interior design and color. Compact, two-note models; short-tube chimes; a combination NUTONE Door Chime and *Telechron* kitchen clock with a large, legible dial; long-tube chimes in two-note and combination four- and eight-note styles —some with fine built-in Hall Clocks.

Prices from $3.95 to $59.95 (list) make it easy to meet cost specifications on every type of home.

Send for your copy of a new folder which illustrates and describes all fourteen NUTONE Door Chimes.

NUTONE IS THE WORLD'S LARGEST MAKER OF DOOR CHIMES

NUTONE TRADE MARK DOOR CHIMES

. . . better living means better listening, too!

NUTONE INCORPORATED, MERCHANDISE MART, CHICAGO 54;
200 FIFTH AVE., NEW YORK 10; 931 EAST 31st ST., LOS ANGELES 11; TERMINAL SALES BLDG., SEATTLE 1

• Electrical contractors, builders, and architects the country over know they can always rely on Raco. They know it's the packaged line, the uniform line, the dependable line—that it's backed by 34 years' experience in the precision fabrication of steel products. Furthermore, Raco products are listed by Underwriter's Laboratories. Write today for information on this *complete* line of switch and outlet boxes.

SEND FOR FREE COMPLETE CATALOG ON RACO PRODUCTS

ALL-STEEL EQUIPMENT, INC.
600 Kensington Avenue, Aurora, Illinois

RACO
ALL-STEEL PRODUCTS

A Complete Line of Switch and Outlet Boxes

ALL-STEEL EQUIPMENT, INC.

DEPRESSION IN '47?
...controls can bring one

IT IS CONVENTIONAL for the American business man, who values freedom, to protest against government regulation. On this account, many people who do not know the facts in detail are inclined to discount current business protests against the post-war application of wartime economic controls. This is particularly true since in his report for the third quarter of this year, the Director of War Mobilization and Reconversion implied that business is in fine health by remarking that "business profits, after taxes, are at the highest point in history."

In complaining about government controls, however, the American business man is not crying wolf. These controls were an essential war weapon. Now, however, they are contributing decidedly to a twisting and distorting of the American economy in a degree which, if not soon corrected, may well start production and employment down the toboggan.

One general indication of how badly twisted our economic system has become is found in the wide disparities in the amounts by which different groups of prices have increased. Since 1941, for example, farm prices have advanced an average of about 125%. Industrial prices, more tightly controlled than any other group except rents, have increased only about 32%. Meanwhile, straight time hourly earnings of industrial workers have gone up about 60% and the cost of living about 43%.

The advances of individual prices within these groups have also varied enormously. Among industrial prices, that of finished steel has gone up only about 14% since 1941, while lumber has gone up over 50%. Hourly wage rates in the women's garment industry have gone up 116%, while those in the brewing industry have gone up only 33%. That share of the cost of living due to rent has gone up only 4%, while that due to the cost of clothing has gone up over 60%.

Well, What Of It?

At least four things of major importance:

1. Production, under the influence of price control, has been heavily concentrated in some lines to the neglect of others. Result—unbalanced production, unbalanced inventories, and a serious cut in the flow of goods to consumers.

2. More or less uniform post V-J Day wage increases, promoted by the federal government, have imposed a far more serious cost problem on some industries than on others. This is particularly true of some of the most basic industries.

3. While, as a whole, "business profits, after taxes, are at the highest point in history" (due in part to a temporary excess profit tax rebate arrangement) there are enormous disparities in the profits of different industries. Some key industries are making little or no profits.

4. If not corrected, the distortion of prices, wages and production, which has resulted in such a wide disparity of profits, can contribute decisively to a major business upset.

The most striking example of the distortion of production by controls was, of course, that provided by a metropolitan meat famine at a time when beef cattle crowded the ranges. This has now been recognized. But there are many other distortions. Abundance of sports clothes, acute shortage of more essential clothing made from the same kind of cloth. Successive shortages of critically important products like baling wire and nails as the price lid on steel is jiggled first this direction and then that.

Some of these distortions of production are due to material shortages. But a major contributor is uneven application of controls, and the total removal of some while others are held firm. Among the results are bulging inventories of partially completed assemblies and shut-downs while waiting for parts.

Wage Complications

While price controls, unevenly applied, have shunted production first this way and then that, the federal government has further complicated the situation by promoting uniform wage rate increases without regard to varying capacities to pay them. The greatest single contribution to this distortion was made by the President himself. In the course of

unsuccessfully trying to mediate the dispute over steel wages last January he recommended a wage rate increase of 18½ cents an hour. Immediately that increase was accepted by organized labor as par for the first round of wage adjustments, having the sanction of the White House itself. The game then became to beat par.

But the capacity of different industries to pay wage increases varied greatly. During the war some had hiked their pay much more than others. Moreover, in some industries wages are a much larger element of total cost than in others. In 1939 (last year for which figures are available) wages ranged all the way from 2½% of total sales in cigarette manufacturing to 34.3% in hosiery manufacturing and 65.2% (for wages and salaries combined) in soft coal mining.

Under these circumstances, some industries were far less able to meet a uniform wage increase than others. Nonetheless, many of them had uniform wage increases imposed upon them. Then the price lid was held firm. This, coupled with material shortages and production difficulties which also choked output, squeezed the profit right out of those industries.

A Study In Contrasts

Some of the most important industries are making little or no profits while they bump along on a production volume which fails to meet consumer needs and prevents attainment of maximum efficiency. The automobile industry affords one conspicuous example. Another is electrical manufacturing, and rail equipment is yet a third. All of them are crucially important. Many other lines of business, of course, are extremely profitable. For example, the profits of a group of large retail stores were 150% higher during the first half of this year than they were a year ago; the profits of a group of motion picture companies were up 140%.

In the meantime, the workers in some of those low-profit industries are in no bed of roses. The increase in the cost of living since 1941 is now outstripping the increase in the hourly wage rate of workers in a number of industries, where wage rates have not risen as much as the average. On a weekly basis, a shorter work week, with less overtime, has combined with the recent upsurge in consumer prices, to place the living standards of some of these workers below the wartime level.

Such circumstances obviously create pressure in the ranks of these workers for another round of wage increases. But as long as the profit remains squeezed out of their industries wage increases, if any, must be translated either into higher prices, or, if the government sits tight on the price lid, into losses which will discourage production and ultimately cost workers their jobs.

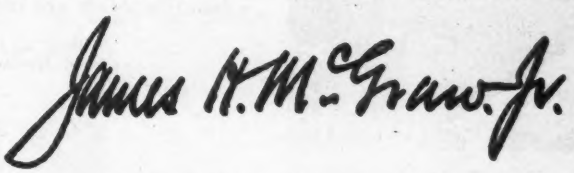
What To Do?

Salvation both for the workers and for employers in the relatively profitless section, a peculiarly important group of industries, must be looked for primarily by increasing productivity, thereby decreasing the cost per unit. Part of this higher productivity can come only from individual efforts of the workers themselves. Another part can come from an elimination of bottlenecks in materials and parts which prevent the labor force from working most efficiently. Only by greater output per man-hour can workers and management solve their common problem.

Until productivity has been thus increased, it is hard to think how the federal government could do a greater disservice both to labor and to industry than to repeat its performance of promoting a uniform national wage increase. With the present distortion of the national economy, some industries might again take such an advance in their stride. With many others it would raise even greater havoc.

While avoiding like the plague promotion of another uniform wage adjustment, the federal government must make it a primary objective to relieve distortions caused by the uneven application of other controls, primarily price control. Nature has given a lift to the elimination of distortions by providing bumper grain crops which should in time reduce that staggering disparity between a 125% increase in farm prices and a 32% increase in industrial prices. But that process must be speeded as a matter of conscious policy. No element of such a policy is more important than expediting the decontrol of industrial prices. Such a course is clearly essential to achieve that balance in the production of materials and parts required for maximum output.

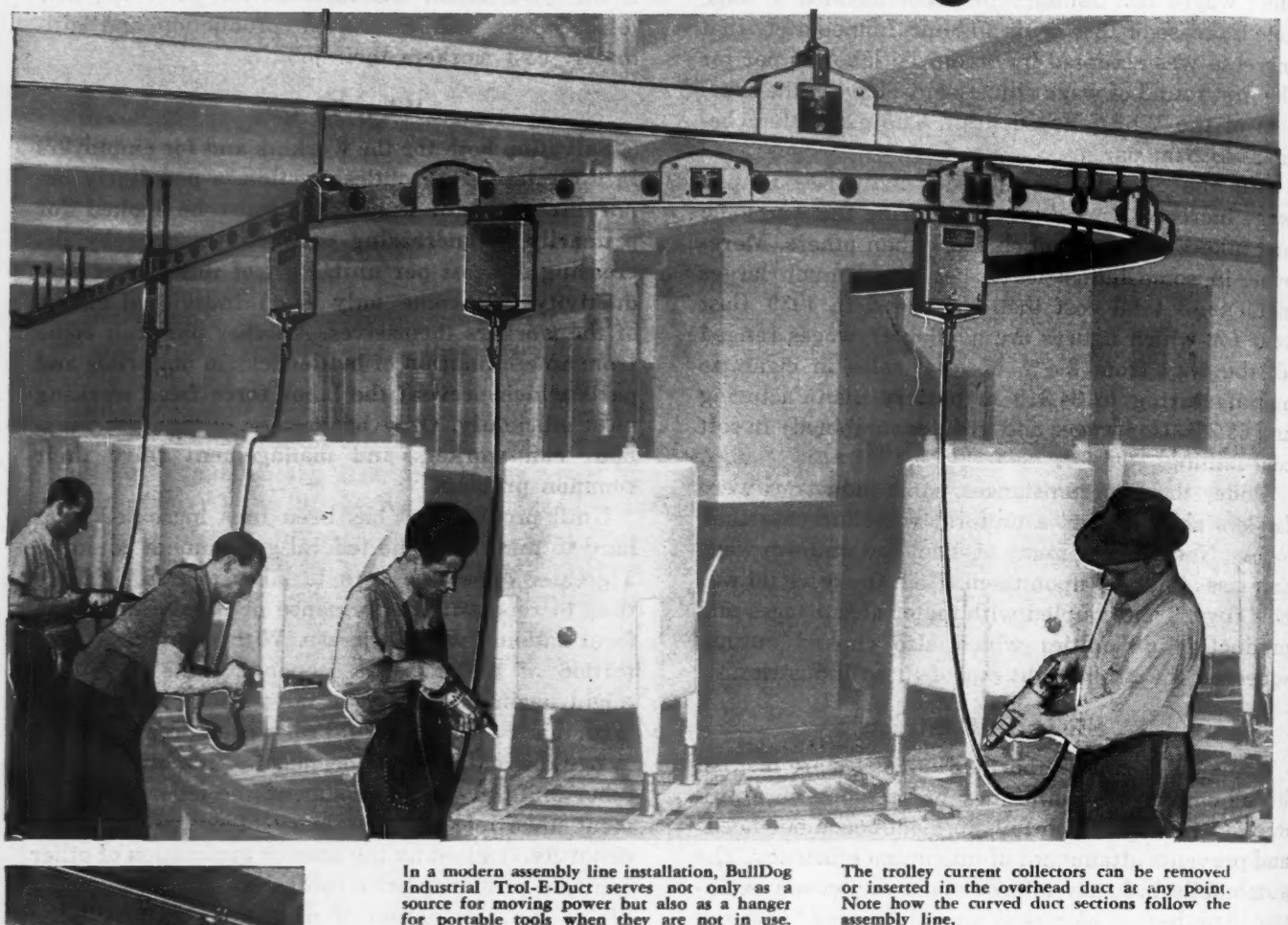
Business and labor both want a sustained prosperity in which all will share. Sustained prosperity can be achieved only if we eliminate the distortions in wages, prices and profits which now restrain so much vital production.



President McGraw-Hill Publishing Company, Inc.

THIS IS THE 52ND OF A SERIES

Tools, Cranes, Hoists... Powered on the go!



In a modern assembly line installation, BullDog Industrial Trol-E-Duct serves not only as a source for moving power but also as a hanger for portable tools when they are not in use.

The trolley current collectors can be removed or inserted in the overhead duct at any point. Note how the curved duct sections follow the assembly line.

PLUG IN NEW LIGHTS ANYWHERE WITH UNIVERSAL TROL-E-DUCT

This flexible system of quickly movable outlets enables you to meet instantly any change in your lighting set up or requirements. You simply move lights along the duct or add new lights where needed.

ADD NEW MACHINES WITHOUT CUTTING POWER

—you can do it with BullDog BUStribution DUCT. A variety of circuit protective tap-off Bus Plugs enables you to spot and plug in plant machinery instantly . . . without rewiring expense.

You can do it with BullDog Industrial Trol-E-Duct

To speed production and reduce operating costs in a modern industrial plant, you need a safe, convenient source of power that travels along with the job.

You get this kind of power in its most efficient and economical form with BullDog Industrial Trol-E-Duct. Moving trolleys collect current from the safely enclosed copper bus bars in duct runs overhead and deliver it directly to the adjacent moving load.

With this mobile power distribution system, the hazards and interruptions caused by open trolley wires and long, dangling cords are completely eliminated. Gone is the continual expense of replacing wire and adding new fixed outlets.

Like other BullDog bus duct systems for power and light, Industrial Trol-E-Duct is built in standardized, prefabricated sections which can be quickly and easily installed. It can be readily adapted to any shop set-up, or moved to any location with complete re-use of all material.

We invite you to call on BullDog engineers for complete information about this modern, economical method of mobile power distribution—or, we'll send descriptive folders promptly on request.

BullDog Also Manufactures Vacu-Break Safety Switches—SafToFuse Panelboards—Switchboards—Circuit Master Breakers—BUStribution DUCT for "plug-in" power —Universal Trol-E-DUCT for completely flexible lighting.

BULLDOG

ELECTRICAL DISTRIBUTION SYSTEMS

BULLDOG ELECTRIC PRODUCTS COMPANY, BOX 177, R. PK. ANNEX, DETROIT 32, MICHIGAN.
In Canada: BullDog Electric Products, Ltd., Toronto. Field Engineering Offices in All Principal Cities.

NOVEMBER .... at a Glance

Aluminum Wires

Aluminum building wires are on the market and it is hoped will relieve some of the drastic shortage of copper. Aluminum's conductivity, 84 percent of that of copper, offers a design problem, but one manufacturer is offering aluminum in RU and RH insulations which work out in outside diameters about equal to the type R of equivalent current capacity. Weight is down by one half. War born fluxes make soldering easy. More building wire is mighty welcome right now. Whether aluminum wires will take hold to become a serious competitor when copper is again plentiful remains to be seen. Comments on your own experiences with the new aluminum building wires will be most welcome to the editors.

Chores

What with the high price and irresponsibility of occasional help in these times, chores are burdening the master of the house. While snow shoveling is good for the soul, it's sometimes pretty rough on the arteries. Besides, it takes time from more sociable if equally strenuous winter sports. We hope a few of our more intrepid readers who are willing to take a chance with the electric meter will lay down a line or two of soil heating cable flanking the walks. If someone can work out an effective snow melting job at a reasonable price, he will likely establish himself along with Faraday and Edison as a benefactor of his fellow man.

Price Control

With practically all foods now decontrolled by OPA and most of the other life necessities out or about to be out from under this hangover of war, it is a puzzle why electrical materials must still be restrained. How many of the scarcities in little items is due to inability of manufacturers to bid for materials in competition with other industries we don't know, but it's high time we were allowed to find out through a free economy. The development of practical and useful substitutes, for instance, may depend upon a small price differential which only a free market can safely establish.

Power Strike

Plenty of newspaper space has been devoted to the recent power strike in Pittsburgh. It was the longest and most costly in history. We could devote pages to the economic and political aspects, but Industrial Editor Hugh Scott brought back the story you will want to read. It's what electrical contractors and plant electrical departments did to keep commerce and industry going. See his timely and exclusive article "Emergency Power for Pittsburgh" on page 50.

Recognition

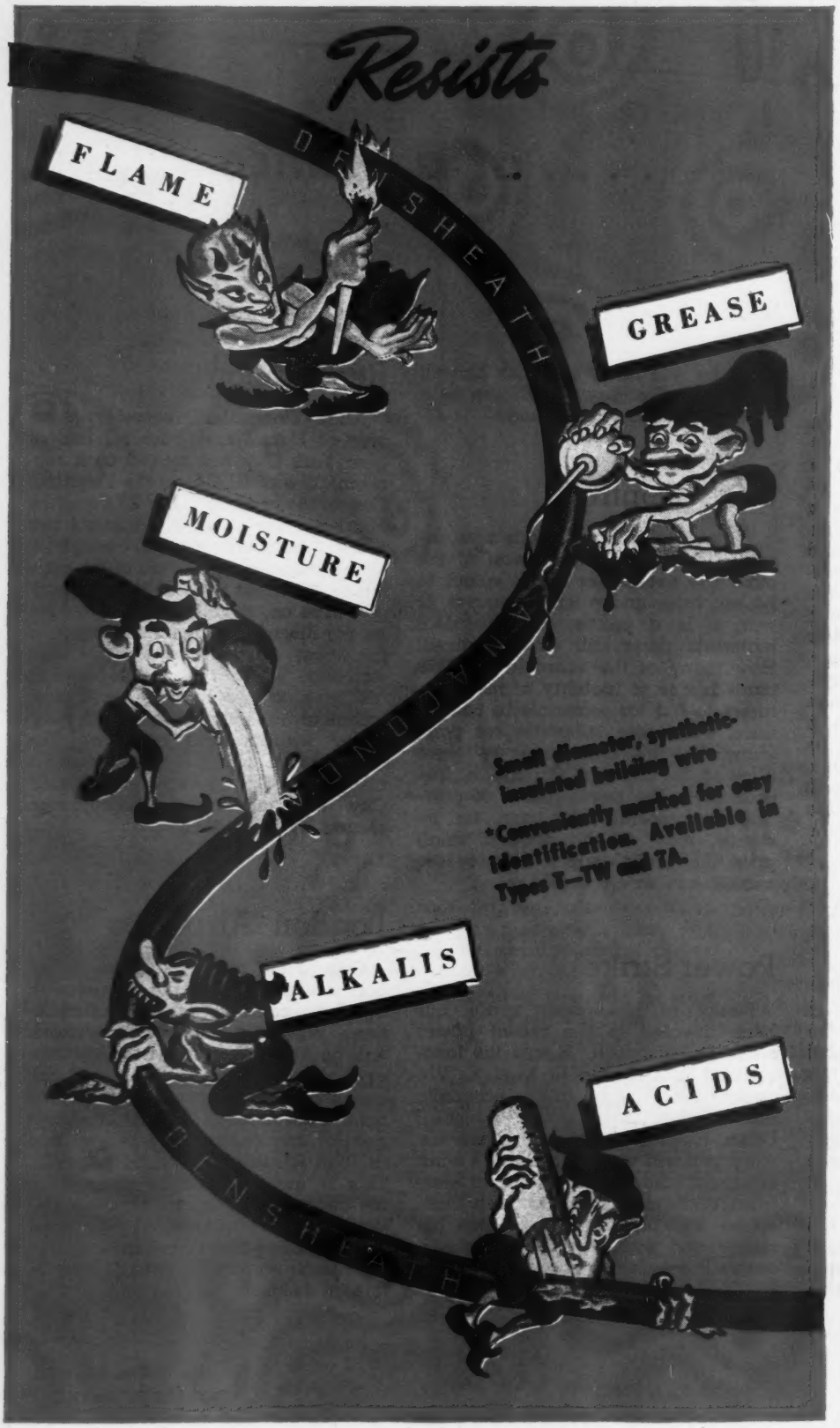
Allan Coggeshall, secretary-treasurer of Hatzel and Buehler, Inc. of New York City has retired as a representative of NECA on the Electrical Committee of NFPA. For 23 years he has been one of the contractor's two voting members in that important code-making body. Of all of the committee jobs that men in this industry can take on, a voting representative on the Electrical Committee is one of the most difficult, responsible and exacting. Mr. Coggeshall brought to his task a wealth of experience, technical understanding, sound judgment, wisdom and courage. The members of NECA gave tribute to his outstanding service at Atlantic City last month, an appreciation shared by all the industry.

London Airport

One of the major problems of airport design is the rapid progress in lighting, controls and communication. What the accepted standards will be five years from now few can even guess today. But runways are expensive and appallingly permanent. How London Airport is equipped for any contingency is well told in John Christie's story on page 52. This is our first feature story from the recently expanded McGraw-Hill World News organization. We hope to have many more from time to time discussing important wiring jobs in foreign fields.

Densheath*

REG. U. S. PAT. OFF.



TYPE T and TW BUILDING WIRE

Equal to the most severe exposures, it's the wire to serve you best for normal interior use.

★ Remarkably durable insulation—a synthetic compound of extremely dense formation. Smooth, polished finish.

★ Highly resistant to moisture, acids, alkalis, chemicals, mineral, animal and vegetable oils.

★ Will not ignite, burn or support combustion.

★ Unusually pliant—has no "spring." Retains any bend.

★ Tensile strength and elongation similar to values obtained on rubber compounds.

★ Super-aging compound superior to any rubber compound in resisting ozone, oxygen and sunlight.

★ Dielectric strength superior to that of usual grades of rubber insulation. Good insulation resistance. Low specific inductive capacity.

★ More circuits per conduit—for new installations, extensions and maintenance.

★ Resists a reasonable degree of abrasion, tearing, bending and flexing.

★ Strips easily; leaves bright conductor.

Densheath is also ideal for use in wiring machine tools, equipment in acid treating plants, chemical plants, wherever single or multiple control cables are exposed to unusual hazards. Available in a variety of colors. Anaconda Wire & Cable Company, Subsidiary of Anaconda Copper Mining Company, General Offices: 25 Broadway, New York City 4, Chicago Office: 20 North Wacker Drive 6, Sales Offices in Principal Cities. 46200

***Type T† for dry locations; Type TW† for moist locations. †New designations for Types SN and SNW**

ANACONDA

ANACONDA WIRE & CABLE COMPANY

IT HELPS YOU

INFRA-RED BAKING replaced a fuel fired system on an enamel finish line in an Eastern industrial plant a few weeks ago. The work of adjusting the assembly line to the new technique in the presence of several technical problems developed know-how and materials which will certainly establish infra-red for this kind of finishing throughout the plant.

BECAUSE OF THIS INSTALLATION, a transformer manufacturer is working overtime, an electrical contractor has a large crew installing new feeders, a utility is re-planning a distribution line. The whole electrical industry is feeling the effect through its length and breadth. Because one industrial electrical engineer chose to pioneer in the application of electricity to one process, our industry is a little bigger, its opportunity greater, its jobs more abundant, better paid and more secure. Such case studies in electrical interdependence are all around us. The fact of electrical interdependence needs no proof. Once recognized and understood, it is self evident.

LAST MONTH NECA ADOPTED the "Declaration of Electrical Interdependence" as its own policy. Contractors are notoriously individualistic in their approach to industry-wide responsibilities. The NECA resolution is a long step forward at the national level. However, it must be actively supported at the local level, not only as a group project, but as the personal responsibility of every individual. Each must realize that in every public contact *he* is the electrical industry, with the responsibility for constructive, creative selling of *all* the industry's goods and services.

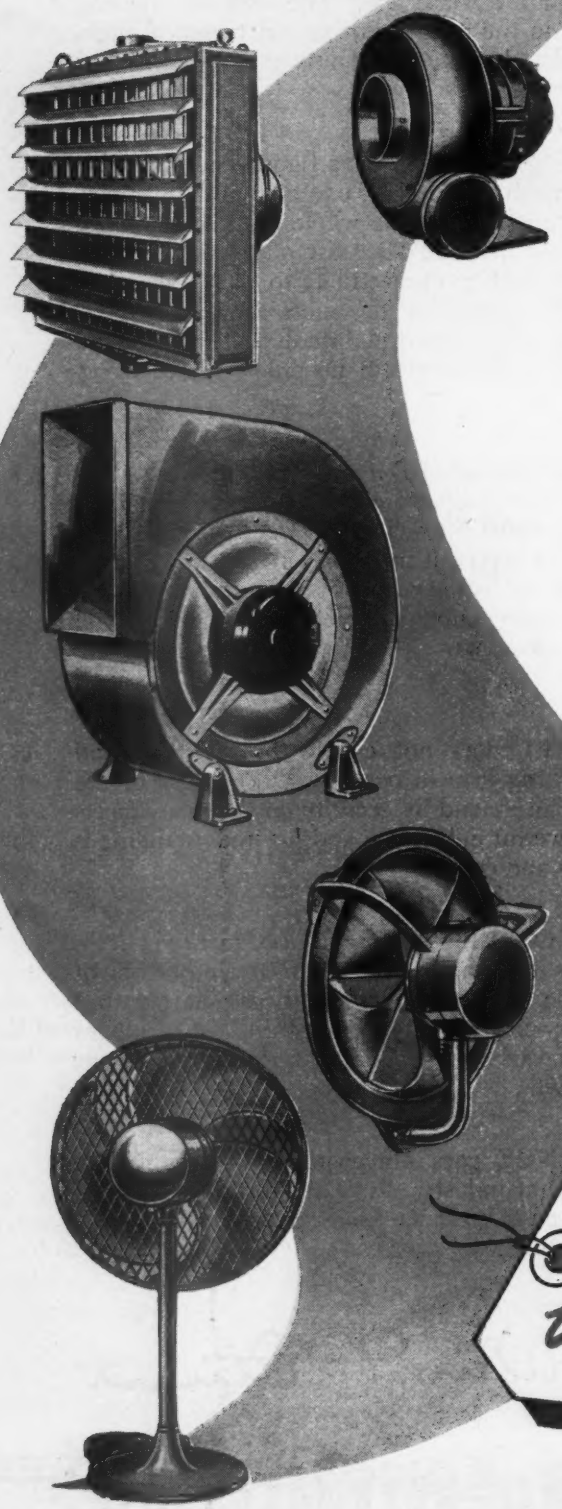
THE RESPONSIBILITY does not end with executives and department heads. It rests equally upon the man in overalls. Once aware of the complex interdependence of his job, his future and his security on the many facets of the electrical industry, he can be a powerful influence. And his understanding is a job for management through education and example.

ELECTRIFICATION OFFERS so many devices, methods, techniques, helps, conveniences and comforts it has become a large factor in our way of life. But we have no exclusive franchise. Folks can cook with gas; heat with a variety of fuels; control pneumatically; power by gasoline, steam or air; light sparingly or generously. And there are powerful influences and forces that are ready and willing to move in when we slow down.

IF INTERDEPENDENCE goes unrecognized and unheeded, it can breed strife, frustration and a host of industry ills. Frankly recognized and acknowledged, however, it can be a source of great harmony and strength. Put to work it can be a foundation for unlimited industry progress.

Wm. F. Stuart

Ventilation
AND SPACE HEATING



GRAYBAR DISTRIBUTES ILG BLOWERS, PROPELLER FANS, UNIT HEATERS, ACCESSORIES . . . OFFERS SPECIALIZED HELP TO CONTRACTORS

In the famous Ilg line, which Graybar distributes, you'll find apparatus to meet all your customers' needs for removing fumes, dust, heat, or stale air from a single room — for ventilating an entire plant — or for space heating or drying. The near-by Graybar Specialist can help you plan the best system for any job.

Other Graybar Specialists — in wiring, lighting, communication, and power apparatus — are always on call to help you plan any type of electrical installation. Though today we may not have in stock *all* the equipment, supplies, and tools you need, there are hundreds of electrical items which our near-by warehouse *can* deliver immediately. As production increases, we'll be increasingly able to supply everything you want — at a moment's notice.

Graybar Electric Company. Executive offices: Graybar Bldg., New York 17, N. Y.

IN OVER 90 PRINCIPAL CITIES

4695

ADEQUATE WIRING SERVES AND SAVES — THE KEY TO THE HOME OF TOMORROW

Everything for Electrical Contractors via GraybaR

Outlook and problems of construction industry discussed by outstanding leaders in business, industry, government and labor, and the McGraw Award presented to George Andrae during annual meeting of National Electrical Contractors Association.

THE 45th annual meeting of the National Electrical Contractors Association was held at the Ritz-Carlton Hotel, Atlantic City, N. J., October 14-18. It was the largest meeting in the history of the association, the registration totalling over 900 delegates and guests from all parts of the United States and Canada.

The theme of the convention was "Protect the Future". On the program were speakers from business, government, industry and labor discussing the problems of the construction industry, with strong emphasis on housing.

In the keynote address opening the meeting, Robert W. McChesney, president of NECA called for an immediate end of wage and price controls and the return of industry to a competitive basis. He stated that we must reestablish quickly the system of American free, private, competitive enterprise and recommended that the convention take decisive action to so indicate. He called for cutting costs of construction and revision of building codes to permit minimum standards of safety and that they be opened to new and rapid methods of construction and the development of new materials. Research must be accelerated, Mr. McChesney said, noting that in the construction industry research was lagging badly.

Paul M. Geary, executive vice president of NECA, reported that during the past five years the membership has been multiplied by two and one half, the number of its active chapters by four, the size of its staff by three and one half and its annual dues revenue by six and one half. These accomplishments are merely means to the end objective of NECA, which is to preserve and extend the opportunities for profitable business available to electrical contractors and to provide the membership with every type of business information and service that can be provided on a group basis more advantageously than the individual can provide it for himself.

The treasurer's report was given by Laurence W. Davis, general manager and treasurer. He pointed out that in carrying out their program during the past year they had kept well under their budget of $200,000. Clint J. Harder, national secretary, in his report stated that the membership is now 2,010, an increase of 571, approximately a growth of 40 percent in the past year.

George B. Roscoe, public relations director, urged the contractors to do a better selling job. He outlined the lighting schools for electrical contractors being conducted throughout the country in cooperation with General Electric Company. He recommended the adoption of the Guaranteed Certification Plan developed by the Southeast Texas Chapter, by every chapter.

The Tuesday morning session was concluded with an outline by Leo H. Cleary, Technical Director, of the activities of the Technical and Research Department of NECA. He said that new cost data sheets for the Manual of Labor Units are being compiled for several types of installations including bus duct and underfloor systems. The 1947 program involves expansion of technical services to members.

On Monday evening Samuel G. Hibben, director of applied lighting for the Westinghouse Lamp Division,

E. B. Oberlander, Oberlander Electric Co., Peoria, Ill.; R. E. Vierheller, Mgr., St. Louis Chapter, NECA, St. Louis, Mo.; Jack G. Krider, Mgr., Illinois Chapter, NECA, Peoria, Ill.; Lyle Foster, Foster Electric Co., Peoria, Ill.

L. to R., Lester C. Watson, Mgr. of Sales, The Trumbull Elec. Mfg. Co., Plainville, Conn.; W. J. Batchler, District Manager, The Trumbull Elec. Mfg. Co., Philadelphia, Pa.; A. G. Paves, Salesman, Westinghouse Electric Supply Corp., Baltimore, Md.; Charles H. Stark, Stark Electric Company, Baltimore, Md.; James A. Cahill, Youngstown Sheet & Tube Co., Philadelphia, Pa.

Frederick P. Coffey, Anderson-Coffey Co., Inc., Boston, Mass.; Alfred J. Hixon, Hixon Electric Co., Boston, Mass.

J. N. Pierce, Pierce Electric Co., Chicago, Ill.; W. E. Frazer, H. B. Frazer & Co., Philadelphia, Pa.

John W. Jenner, Shelley Electric Co., Wichita, Kans.; Geo. A. Seaman, NECA Representative, Div. 5, Ft. Worth, Texas; Chas. W. Paige, Mgr., Kansas Chapter, NECA, Topeka, Kans.; L. T. Allen, Allen Electric Co.; Tulsa, Okla.

Bloomfield, N. J., gave a demonstration of the new wonders of light. Also the Westinghouse Walt Disney film "Dawn of Better Living" was shown.

The Wednesday morning session was opened with a discussion by Irving W. Clark, manager, Better Homes Department, Westinghouse Electric Corp., of the contributions to better living. He presented a demonstration board featuring four "degrees" of electrical living — "thrift", "budget", "ideal" and "deluxe." He urged the contractors to place greater emphasis on better wiring in the home in order to get the full enjoyment of the numerous electrical appliances available, through creative selling to the customer and working with the local building contractors.

Don B. Clayton, president of the Electric Constructors, Inc., of Birmingham, described the business of a contractor engaged in building as a battle royal with missiles coming at him from every direction. These problems, resulting in higher costs, involve labor, materials, practices of customers, practices within the industry and government. The electrical contractor must convince his customer that the real cost of an electrical installation is not "F.O.B." but "R.F.O." (ready for operation).

Construction in the United States is coming to a standstill because of a socialistic program in the hands of government agents who seek to give a boost to the Administration's political program, Douglas Whitlock, past president of the Producers Council and a member of the Construction Industry Advisory Council, said. We must be able to say whether we can build the necessary housing, how much rental housing is needed and whether we can reduce the cost of housing where it is within reach of the majority of citizens.

S. B. Williams, Editor, Electrical World, New York, N. Y. Geo. Andrae, Herman Andrae Elec. Co., Milwaukee, Wisc. receiving McGraw Award.

At the banquet on Wednesday evening, George Andrae, president of Herman Andrae Electrical Company, Milwaukee, Wis., received the James H. McGraw Award Contractors Medal for 1946. S. B. Williams, editor of *Electrical World* and secretary of the Committee of Awards, made the presentation. The citation accompanying the award read:

"In an industry as dynamic as that devoted to electrical construction most men are so absorbed in promoting their own interests that without realizing it they accept as inevitable the waste, the duplication of effort and oftimes the lowering of standards of performance that accompany the striving for competitive advantages, until some individual with a vision of better service to the public appraises the effects of such wasteful practices and offers a logical, workable correction therefor. For many years George H. J. Andrae, president of Herman Andrae Electrical Company of Milwaukee, Wisconsin, has striven to arouse electrical contractors and others to the need for higher industry standards and for increased efficiency through reduction of waste and the elimination of needless product variations and installation methods.

Joseph Kirchner, Biggs & Kirchner; A. Herman Warren, Electrical Construction Co., Inc.; Robert W. McChesney, President NECA, Harry Alexander, Inc.; C. F. Preller, Business Agent, IBEW; L. T. Souder; Harry W. Kellams, Mgr., Chapter, NECA, all of Washington, D. C.

H. F. Janick, T. H. Green Electric Co., Inc., Rochester; Maynard H. Salmon, M. H. Salmon Electric Co., Inc., Syracuse; Edw. Vanderlinde, Vanderlinde Electric Corp., Rochester; A. Lincoln Bush, Belmont Electric Co., Inc., New York City.

"As the result of his untiring efforts in advocating fewer types and sizes of wiring materials the Division of Simplified Practice of the National Bureau of Standards five years ago, after conferences within the industry, promulgated recommendations for the simplification of wire and cable sizes. A permanent standing committee was created by the Bureau of Standards with Mr. Andrae as chairman to receive and act upon suggestions for further simplification. Although many restrictions made necessary during the war emergency retarded the progress which was being made toward these objectives his active promotion thereof never ceased.

"As a member for years of the Electrical Committee of the National Fire Protection Association, representing the National Electrical Contractors Association, and as chairman of the NECA Codes and Standards Committee, Mr. Andrae has not only been of great service to the entire electrical industry by his study of various National Electrical Code problems and his assistance in arriving at reasonable and equitable Code decisions and interpretations but he has stimulated through his writings, reports and speeches a wider appreciation by members of his own profession of the underlying principles of the Code. His national Code activities were but an extension of his labors in his own state where for the past twenty years he has taken a leading role in the revision, modification and interpretation of the Wisconsin Electrical Code.

"For these contributions to the improvement of his branch of the electrical industry made at the expense of great personal time and effort, the Committee of Awards on the recommendations of the judges has voted to Mr. Andrae the 1946 Electrical Contractors Medal and Purse given under the James H. McGraw Award."

The judges who recommended Mr. Andrae for this honor consisted of Allan B. Coggeshall, Hatzel & Buehler, Inc., New York; Theodore H. Joseph, E-J Electric Installation Company, New York; Louis Kalischer, Louis Kalischer, Inc., Brooklyn, N. Y.; George H. McKee, George H. McKee, Inc., Mount Vernon, N. Y., and S. B. Williams, secretary, Committee of Awards.

The Thursday morning session was opened with an address entitled "What's the Score?" by Arch N. Booth, assistant general manager, Chamber of Commerce of the United States, Washington.

Speaking on the subject, "Protecting Our American Heritage," Arthur W. Binns, president of the National Home and Property Owners Foundation, Washington, declared that unified action by property owners throughout the nation is necessary if the campaign to socialize private property in America is to be halted.

Almost everyone is talking about the possibility of a depression in the near future but no one of us is doing anything to prevent it, John A. Reilly, president of the Second National Bank of Washington, stated. The future of our economy rests on the shoulders of employees, employers and government.

Beardsley Ruml, chairman of the board of R. H. Macy & Co. and chairman of the Federal Reserve Bank of New York City, addressed the luncheon meeting on Thursday. He outlined three objectives for the construction industry. The short term objective is to speedily house the veterans and relieve the pressure for housing generally. The intermediate goal is to create a reasonable stability in the industry through advance planning of public works and conservation projects and through the skillful planning of optional projects. The long term goal is to bring into the industry the fruits of technical and managerial knowledge, to raise the industry to its appropriate place in terms of productivity and efficiency, to reduce costs and prices and to increase annual earnings of workers, and to give a regular and reasonable margin of profit for successful enterprise.

E. C. Carlson, chairman, IBEW Employers Section, presided at the Thursday afternoon session on labor relations and reported on the activi-

Warren Penn, Mgr., Los Angeles Chapter, NECA, Los Angeles; Norman D. Ferguson, California Electric Works, San Diego; Sid F. Hill, Hill Electric Co., Los Angeles; W. H. Welsh, Mgr., Sacramento Valley Chapter, NECA, Sacramento.

Charles J. Powers, Mgr., South Florida Chapter, NECA, Miami, Fla.; Fred H. Stewart, Stewart Electric Co.; Miami, Fla.; Dwight L. Casey, Mgr., Virginia-Carolinas Chapters, NECA, Charlotte, N. C.

W .T. McAuley, McAuley Electric Co., Kansas City, Mo.; S. C. Dodson, Dodson Engrg. Co., Omaha, Nebr.; Arthur E. Smiley, A. E. Smiley & Company, Kansas City, Mo.

L. to R.: Irving W. Clark, Westinghouse Electric Corp., Pittsburgh, Pa.; J. R. Stolzenbach, The Roland Electrical Co., Baltimore, Md.; Charles H. Stark, Stark Electric Co., Baltimore, Md.; A. J. Pickett, Mgr., Greater Cleveland Chapter, NECA, Cleveland; Carl J. Schoeninger, Mgr., Detroit Chapter, Detroit; Harry M. Schulman, A. S. Schulman Electric Co., Chicago; A. H. "Doc" Keith, Westinghouse Electric Supply Co., Chicago.

ties of this Section during the past year.

Paul M. Geary, secretary, IBEW Employers Section, announced that the pension plan agreement between NECA and IBEW had been signed and it would go into effect 60 days after September 3, provided that the Treasury approval is received on or before that date. If approval has not been received by November 2, it will become effective the date upon which such approval is received.

Alfred J. Hixon, president of Hixon Electric Company, Boston, gave a report on the IBEW label program. He stated that IBEW proposed to establish an international union label, which will be administered by the local unions in the various localities as a local activity. However, the time when it is to be put into effect is indefinite but he urged that when it did come, the contractors accept it in the same spirit of cooperation as other union rules.

Arthur D. Hill, Jr., chairman, Wage Adjustment Board, U. S. Department of Labor, Washington, spoke on federal wage controls, and made a plea to the construction industry to comply wholeheartedly with strict wartime wage stabilization controls. The fundamental stabilization principle affecting the construction industry is unchanged. This means that no increase or decrease may be legally placed in effect for construction workers without prior Wage Adjustment Board approval.

A paper prepared for the convention by Dan W. Tracy, president-elect, IBEW, Washington, was presented by Lawson Wimberly on labor management cooperation in the public interest. Mr. Tracy outlined various sub-goals to be striven for as components of successful labor-management cooperation in the public interest. These include: (a) ever improving standards of construction, maintenance, and repair in the contracting field of the electrical industry, operation in the public utilities field and production in the manufacturing field, (b) education of the public in the manner and forms of such improvements together with the value thereof and the benefits to the public deriving therefrom as well as the long range and economies resulting, (c) reduction to a minimum, if not total elimination of work stoppages, resulting from industrial disputes, whether in the form of strikes or lockouts.

Members interested in line construction work held a conference on Thursday evening. At the conference they organized the Line Construction Contractors Division of the IBEW Section of NECA. The purpose of the Division is to provide electrical contractors specializing in line work a national medium with regional facilities through which they can express their collective voice and formulate activities for their mutual benefit and protection.

The new Division adopted bylaws at this meeting and provided for a division of the United States into six geographic units having the same territory as the six NECA Divisions. A NECA Line Construction Contractors Committee, comprised of one member from each of the Divisions, was set up under the chairmanship of C. W. Moseley of R. H. Bouligny, Inc., Charlotte, N. C. Mr. Moseley represents Division Three. The other members are Division One, Frederick P. Coffey, Anderson-Coffey Co., Inc., Boston; Division Two, Bruce Ross of the Ross Electrical Construction Co., Philadelphia; Di-

L. to R.: Paul Heydon, Mgr., Spokane Chapter, NECA, Spokane; E. L. Buttner, Scott-Buttner Electric Co., Oakland; J. D. O'Connor, Luppen & Hawley, Inc., Sacramento; Geo. L. Rosenberg, T. L. Rosenberg Co., Oakland; R. K. Robinson, Robinson Electric Co., Inc., Charlotte, N. C.; C. W. Moseley, R. H. Bouligny, Inc., Charlotte, N. C.; A. M. Burnett, Crescent Electric Company, Kansas City, Mo.; Fred E. Geiss, Geiss Electric Company, Kansas City, Mo.; B. H. Boatner, Westinghouse Electric Supply Co., Chicago, Ill.; Albert Kahn, Monroe Electric Co., Chicago, Ill.

L. to R.: Douglas Whitlock, Producers Council, Washington, D. C.; Jack W. Collins, Mgr., Greater Kansas City Chapter, NECA, Kansas City; J. Walter Collins, Mgr., Chicago & Cook County Chapter, NECA, Chicago; Murray L. Ansel, J. Livingston & Co., Detroit; H. J. Hall, Hall Engrg. Co., Detroit; Oklahoma Delegation—Bill Damon, Mgr., Oklahoma Chapter, NECA, Oklahoma City; George Gaddis, Gaddis Electric Co., Oklahoma City; Prescott F. Reib, Asst. Mgr., Oklahoma Chapter, NECA, Tulsa; L. T. Allen, Allen Electric Co., Tulsa.

vision Four, R. J. Stretch, Monroe Electric Co., Chicago; Division Five, James L. McClure, McClure Electric Co., Dallas and Division Six, R. B. Lane, Industrial Electric Co., Seattle, Wash. Paul M. Geary was appointed secretary of the Committee.

The new 1946 National Electrical Code, which becomes effective November 1, has important features that will bring added electrical safety, efficiency and economy to the home, store and factory, George Andrae, chairman of the NECA Codes and Standards Committee, told the concluding session on Friday morning.

He pointed out some of the new items that appear in the Code for the first time and urged all to study them carefully. There is a requirement that a receptacle outlet of a three pole type designed for grounding be installed for laundry appliances, but this requirement merely recognizes and does not remove the hazard, he said.

Mr. Andrae discussed in detail new developments in wire and insulation during the war. These are covered in new tables in the Code. He urged that in the interest of simplification, efficiency of installation and economy to the public, that the electrical contracting industry concentrate and promote the use of a "standard bread and butter" type of wire, which he said would save copper and steel, money for the customer and would reduce wire stocks for the contractor and jobber.

George W. Patterson, chairman, NECA Cost Data Committee, urged all members to send in estimating data for use in the work of this committee in preparing technical and research material. Leo H. Cleary, technical director, is assisting Mr. Patterson in this work.

R. A. Goeller, Hatzel & Buehler, Inc., New York City, led a discussion on fee and labor only contracts.

A resolution was adopted in appreciation of the outstanding service rendered by Allan Coggeshall, secretary-treasurer of Hatzel & Buehler, Inc., New York City, for his work during the past 23 years as one of NECA's two voting members of the Electrical Committee, NFPA; and the contribution he has made to the electrical contracting industry in protecting the interests of the public and the contractors in code making, through his unselfish service and sound thinking.

The Association also adopted unanimously a Declaration of Electrical Interdependence in which NECA formally recognized the dependence of all branches within the electrical industry in the task of expanding the value of the electrical dollar to the public.

Another resolution was adopted petitioning the 80th Congress, which assembles next January, to make as its first order of business the termination of all wartime regulating wages and prices.

The Association also petitioned Congress to speedily amend the Fair Labor Standards Act of 1938 (Wage-Hour Law) so as to make the language clearly say that no retail or service firm having most of its sales in intrastate commerce may be regarded as an interstate operator, and hence subject to the Act, notwithstanding the ultimate use of the produce by the purchaser at retail.

J. Norman Pierce of the Pierce Electric Company of Chicago was re-elected vice president of Division Four and W. Edward Frazer of H. B. Frazer & Company, Philadelphia, vice president of Division Two.

Next year's annual meeting will be held in San Francisco.

L. to R.: Wm. F. McCarter, Cates & Shepard, Philadelphia; Howard L. Miller, Utilities Engineering Co., Philadelphia; Murray L. Ansel, J. Livingston & Co., Detroit; Ovill Fiener, Chapel Electric Co., Jackson; Howard Krigbaum, Krigbaum Electric Co., Decatur, Ill.; L. A. Gerstenberger, Art-O-Lite Co., Galesburg, Ill.; Sam C. Dodson, Dodson Engineering Co., Omaha, Nebr.

EMERGENCY POWER for Pittsburgh

Unit generating plants provide three million watts of portable capacity wired to industrial and commercial switchboards during 27-day utility strike and power curtailment.

By Hugh P. Scott

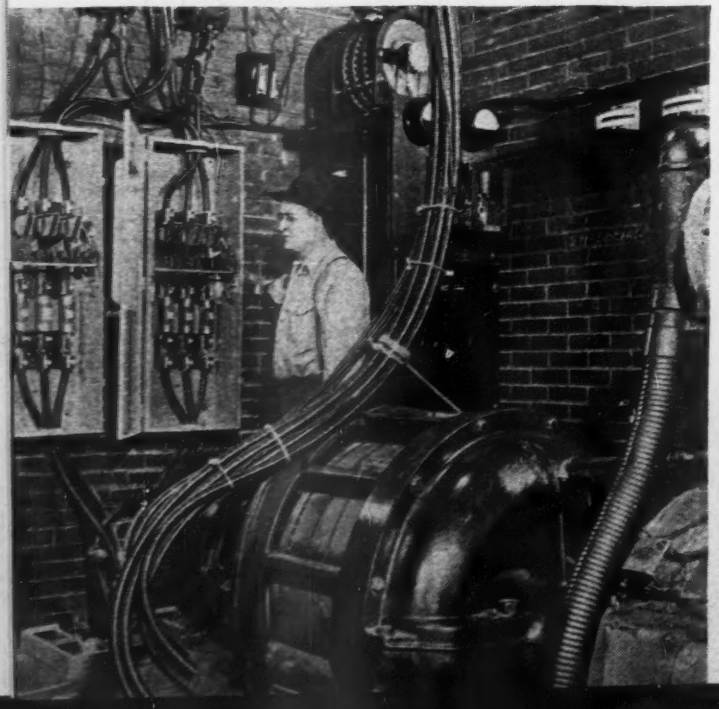
DURING 27 days of an unprecedented utility strike by Duquesne Light Company's operating personnel, the city of Pittsburgh and the one-and-a-half million residents of the 817 square miles served by the company staggered under the combination of drastically curtailed power, transportation and light.

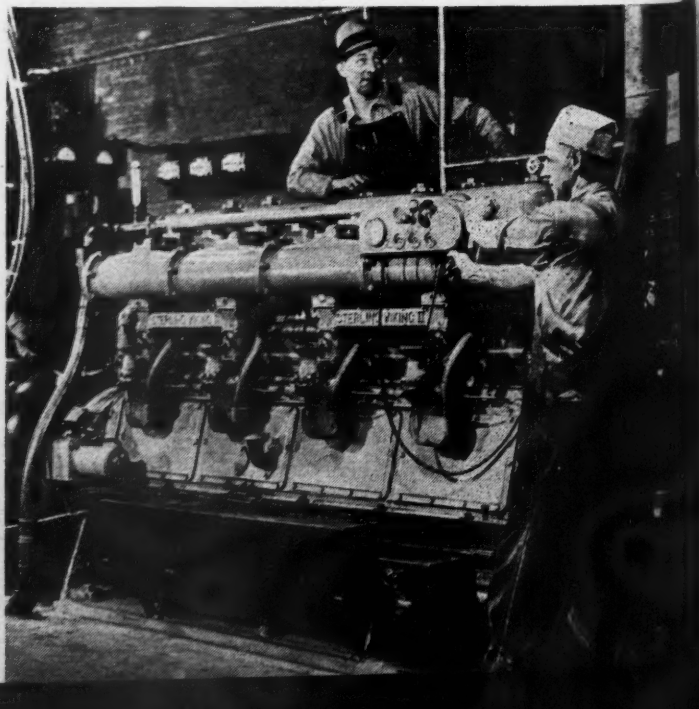
From September 24th to October 20th all of Allegheny and a major portion of Beaver County felt the crippling effects of the strike. Many industrial plants were forced to reduce or halt production; street lights blinked out as filaments and carbons burned to extinction and remained unreplaced due to a lack of maintenance service; trolley service slid to a quarter of normal requirements, then ceased entirely for a three-week span; theatres and enterprises deemed "non-essential to public health and safety" were left stranded for power; office buildings experienced major reductions of elevator service and home owners adjusted their living to exclude normal demands for lighting, electrical appliances and radios. Local authorities estimated that 100,000 non-striking, hourly-wage employees were idle in affected plants and over $500,000,000 were lost through reduced productivity and slashed payrolls.

But although staggering from a terrific body punch, Pittsburgh remained groggily on her feet and was never completely paralyzed. Supervisory employees of the Duquesne Light Company replaced striking production men to keep the four generating plants on the line and interconnections with many customers having large stand-by auxiliary equipment and tie-ins with neighboring utility systems stepped up available power. Newspapers and radio broadcasts urged customers to cut requirements to the bone. During the first day of the strike, public cooperation voluntarily reduced hourly loads to 40 percent of the figures registered a week previously. Hospitals remained relatively unaffected. An aid in disguise was a conjunctional strike of hotel employees which, while closing city hotels, materially reduced electrical loads. Through voluntary cooperation and indirect actions, demand fell nearly as rapidly as utility generation.

The hardest hit were the industrial plants and those establishments labeled "non-essential to public health and safety." Their alternative was to find a solution through their own efforts or close their doors for the duration of the shortage. Their problem received immediate and unexpectedly widespread attention. Friendly hands were extended towards Pittsburgh to

Presses of one Pittsburgh newspaper plant were powered by 220 volt, 250 kw., G. E. generator operated by 8 cylinder, 1200 rpm., Sterling Viking gasoline engine. Connection cables travel from generating unit through switch panel to busbars of main switch board on floor below. Metering and voltage regulating equipment is shown mounted on walls. Equipment was received on job, rewired for 220 volt to change original 440 volt characteristic, installed by the Star Electric Company and placed in operation in three days.





offer auxiliary equipment—usually for a substantial consideration. One of several manufacturers of Diesel equipment set up temporary headquarters in the city and contacted electrical contractors, distributors and affected companies with the announcement, "Can ship from stock Diesel engines 10 to 50 kw. size. Advise requirements." Other firms covered the same field through circular letters and two columns of short, paid advertisements appeared in the Pittsburgh "Post Gazette" offering the critical equipment. Portable plants also were advertised from areas that previously had experienced similar hardships through strikes, explosions and floods in scattered sections of the country. Warner Brothers Pictures, owning 25 generating units that had been purchased for Chicago during the coal strike, immediately shipped 16 mobile plants to the Pittsburgh area where they were installed in key theatres. The city government obtained 27 units through such Army supply depots as Washington, D. C., Richmond, and Bellemead, N. J., and allotted these units to hospitals, non-profit organizations and health-vital municipal locations such as incinerator plants and schools. While the city obtained units mainly through lease or loan arrangements, privately owned commercial and industrial organizations rented or purchased the necessary equipment outright.

Units ranged from 10 to 300 kw. in capacity with the majority falling between 20 and 30 kw. Equipment was primarily a-c although a certain amount of direct current was called for and delivered. More than 100 units were brought in to serve approximately 65 buildings and plants, indicating a connected auxiliary generation potential of 3,000 kilowatts. Although this represented only a fraction of one percent of the Duquesne Light Company's normal load, its relative value was magnified as utility service was reduced.

As in most cases of competitive supply and demand in emergencies, values were measured in terms of need, loss prevention and what the traffic would bear rather than intrinsic worth. During the first week of the strike, distributors with equipment immediately available were asking and receiving rentals of $100 a day for 20 kw. diesel generators, this figure slumping to $20 as supply of equipment increased and demand waned. Skilled electrical and engineering personnel were also in sudden demand to install, operate and maintain new equipment. In one instance a large consumer paid around-the-clock double-time wages to retain an electrical supervisor continuously on the job and unhesitatingly approved the resultant daily charge for 48 hours at $2 per for his services. Several units, installed on a temporary basis, were later permanently wired and retained as permanent stand-by emergency equipment.

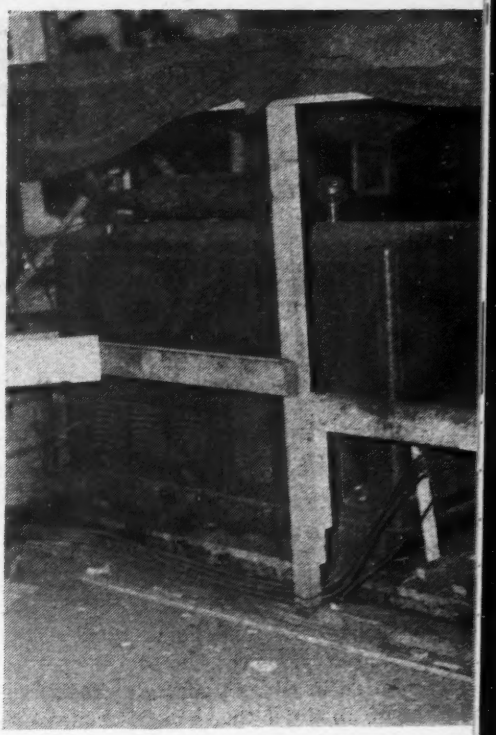
Local Contractors

Local electrical contractors gave excellent service in connecting auxiliary equipment and securing proper clearances through the city's jurisdictional departments. Included among Pittsburgh contractors performing the bulk of the installations were the Frame, Star, Devlin and Raphael electrical organizations.

Emergency wiring was installed conjunctionally with the placing of an order for equipment so that the actual change-over was merely a matter of connecting the delivered equipment and throwing the main switch. Methods of wiring and locations of equipment varied with each installation depending upon available material and space. Units were placed in basements, lobbies, alleyways, and on sidewalks. Connections ranged from C-clamps on main busbars to more elaborate connections including double-throw switches, metering equipment and voltage regulation.

One of these larger installations kept the Sun-Telegram's presses in operation through utilization of a 220 volt, 3 phase, 60 cycle, 250 kw., G. E. generator operated by an 8 cylinder, Sterling-Viking, 1200 rpm., gasoline engine. Cables were run to double-throw switches and thence through the floor to connect with the main switchboard busbars located on a lower level. The equipment, originally 440 volt in rating, was received on the job, rewired in Youngstown, Ohio, installed in the Sun-Telegram building and placed in operation within three days.

Another installation for the G. C. Murphy Company combined two 4-wire, 3 phase, 30 kw., diesel units, obtained from the Army's supply depot at Richmond and installed on the sidewalk, with two portable 20 kw. gasoline units, mounted on pneumatic wheels and located in the building proper. Connection cables were led from the sidewalk-based units through a sidewalk sewer vent to two interior panelboards. Two engineers and an electrician remained in constant attendance.



Generating plants were located in lobbies and alleyways as well as in basements. Store of G. C. Murphy was served by two 4-wire, 3-phase, 30 kw. Diesel units, located on the street, and two portable 20 kw. gasoline units, located inside the building. Connections from street-based units were carried through sidewalk sewer vent to panel boards in basement.

In the face of the emergency, the safety of the public became the governing objective of city inspection departments. Barricading to protect pedestrians was one of the few requirements of the Department of Highways and Sewers while adequate capacity of connection cables and safety of equipment were the primary requests of building inspectors.

The 27-day strike was one of extraordinary public interest and unprecedented in utility history. It included a restraining order; the invoking and dissolution of a union injunction at the request of the city government; contempt proceedings, jailing and parole of union president George Mueller, and constant arbitration between the utility and its production employees both before and after the actual strike. On October 20th, the production men returned to their jobs with negotiation proceedings still in progress.

LONDON AIRPORT

Temporary runway and landing lights at London's international air terminal are served through network of tile conduits designed for future system expansion.

THE electrical system for the new London airport will require several years to complete. During this time the project will be developed as one of the largest and busiest of international air terminals.

In view of the long construction time-table plus the fact that both devices and methods of aircraft traffic control are undergoing rapid change and development, the provisions being made in current concrete construction for facilities that will be required for the ultimate complex electrical system are particularly significant.

To this end it is noteworthy that some 13 different pit designs are being incorporated in the runway construction. Spacing of pits, crossing of ducts and radii of curves are being made standard as far as possible. Toward making adequate provision for mechanical and electrical requirements of the future, ducts are being made under runways and perimeter tracks to meet anticipated requirements for telephone, signals, heating, power and fuel supply.

The 3,000-yard runway at Heathrow has 10,500 lineal yards of two-way and four-way ducts under the concrete slab and some 700 pits.

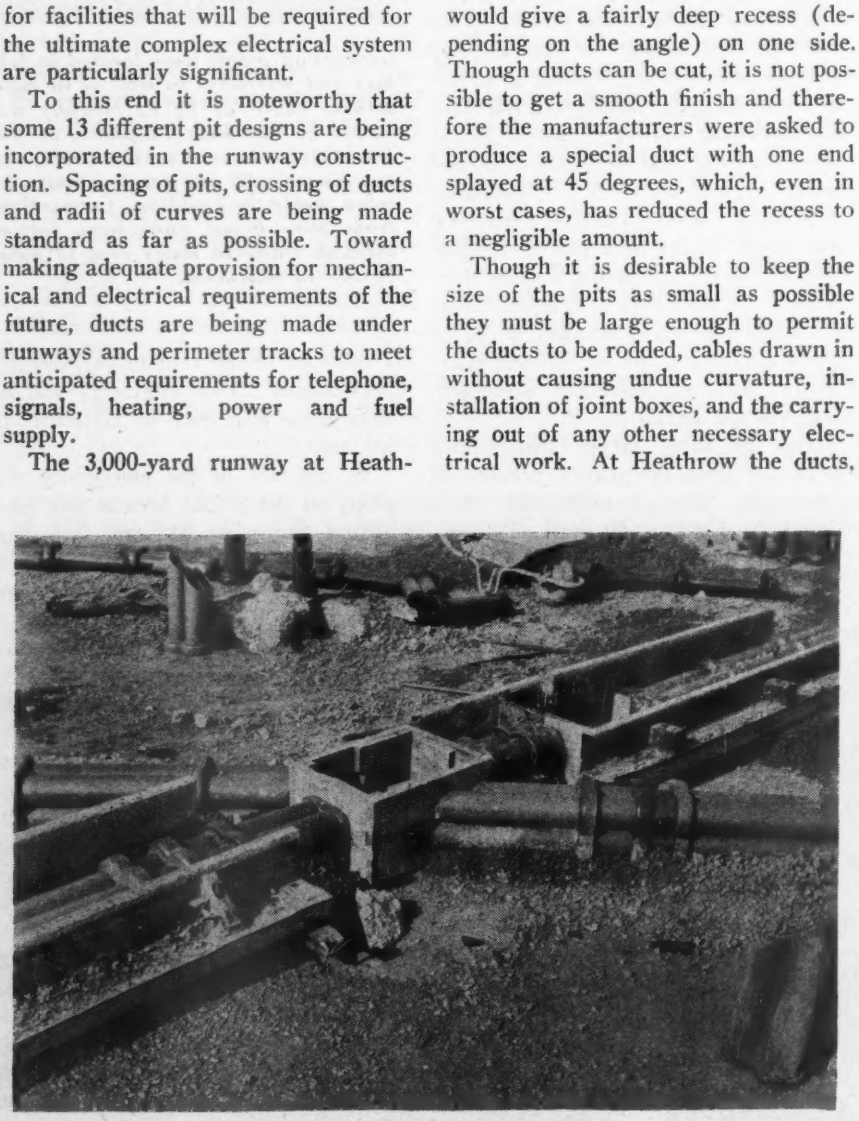
The ducts used were 4-inch two-way and four-way smooth glazed self-aligning ducts and, where pits occur, bellmouths were provided in order to give a smoother surface for drawing in cables than could be obtained by a concrete splay. Lines of ducts do not always intersect at right-angles and the use of bellmouths, in these cases, would give a fairly deep recess (depending on the angle) on one side. Though ducts can be cut, it is not possible to get a smooth finish and therefore the manufacturers were asked to produce a special duct with one end splayed at 45 degrees, which, even in worst cases, has reduced the recess to a negligible amount.

Though it is desirable to keep the size of the pits as small as possible they must be large enough to permit the ducts to be rodded, cables drawn in without causing undue curvature, installation of joint boxes, and the carrying out of any other necessary electrical work. At Heathrow the ducts, generally, have been laid with 3½ inches between the barrel of the duct and the underside of the 12-inch runway slab and the pits were made 1 foot 10 inches square by 2 feet 1½ inch deep for a four-way duct. The opening in the runway slab was made 12½ inches larger each way than the pit in order to provide a 6-inch seating for a 5-inch-deep pre-cast reinforced-concrete packing ring and a 7-inch-deep pre-cast reinforced-concrete cover with four sunken lifting eyes, and to allow a ¼-inch clearance on all sides of the cover so that it can be easily removed for maintenance and inspection purposes at frequent intervals. Where lights occur, a recess in the runway slab on one or more sides of the pits was left for the full depth of the slab and pre-cast concrete blocks grouted in. These blocks were cast with the necessary recesses and holding-down bolts for lighting fittings.

Trenches were excavated in the prepared runway formation. Ducts were laid in straight lines both in plan and elevation between pits, bedded on 6 inches of concrete and surrounded by 6 inches of concrete on either side and 3½ inches over the barrel. Where the sub-base consisted of mass concrete, an expansion joint was provided between the surround to the ducts and the mass concrete.

Before laying, all ducts were inspected and any having the bitumastic self-aligning ring damaged were removed and a new ring was cast on. After laying, each way of the ducts was cleaned out with a mop, a mandrel 3¾ inches in diameter by 9½ inches long was drawn through, and galvanized wire was left in for use when drawing in the cable.

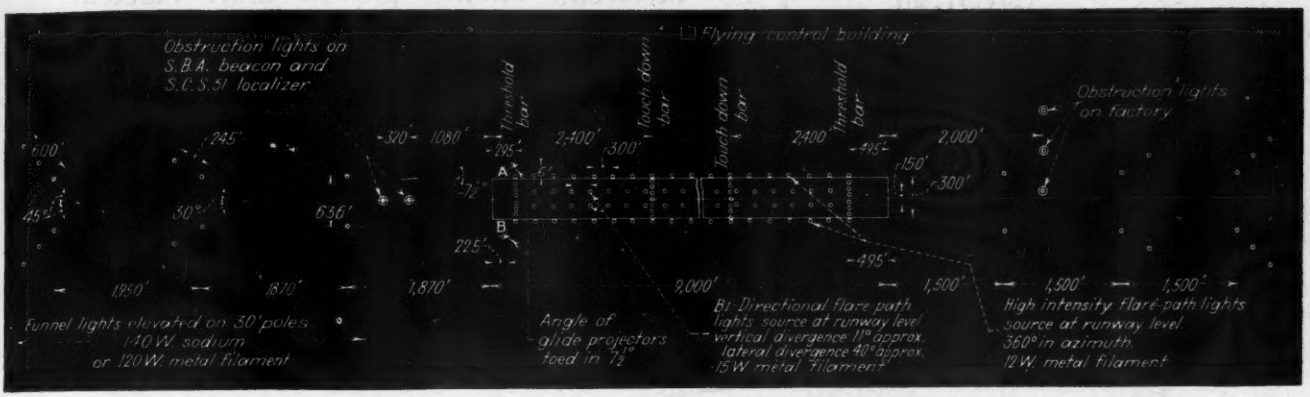
At the same time as the ducts were laid the pits were concreted up to the level of the underside of the runway slab using immersion vibrators. Sectional steel formwork was used and after this had been struck the bottom of the pit was floated off to invert level of the lower ways of the ducts. The opening in the runway slab was also



Clay tile conduits and concrete pits are designed for future systems as airport lighting and communications require.

WIRING

By John Christie
London McGraw-Hill World News



London airport interim approach and runway lighting system.

constructed with sectional steel formwork, which had two braces each way at the bottom. These braces were bent to fit into the finished pit below slab level.

Owing to the use of mechanical spreaders and compactors for the concrete paving it was necessary to keep the formwork below the final pavement level and fit top plates to the forms to prevent concrete filling the pits. After the machines had passed the top plates were removed and the arris of the pit was formed by hand. It was found that the machines tended to distort the formwork but with care and stiffening of the formwork this was overcome.

Since there was very little tolerance on the position of pits and lights it was found necessary, in some cases, to alter the spacing of joints in the runway slab in order to give a reasonable margin between the pit and the joint. In the case of taxi-tracks, the ducts and pits are on the outside, and an expansion joint was constructed between the surround to the ducts and the track and also round the portion of the pit and light which projected into the track.

In view of the ¼-inch gap round the pit covers, which would allow a certain amount of water to enter, it was considered advisable to drain the duct system at various points. The objection was not to water running through the ducts but to stagnant water which might cover junction boxes and other electrical fittings. It was, therefore, possible to use the lower ways of the ducts themselves for leading water to the drainage points. It was decided to drain the system so that in no case did the maximum length between drains exceed 300 yards and, in addition, drains were provided at all low points. As previously mentioned the ducts were laid at the same fall as the surface of the runway, being given a slight gradient where the runway was level. At the pits selected for drainage 3-inch glazed stoneware pipes were taken at a slightly lower level than the ducts to the nearest manhole, main drain, or collector drain and the floor of the pit was given a fall to the drain.

CABLING—Self aligning glazed earthenware ducts carry the cabling system. A tough rubber cable is used in the present temporary lighting scheme. Cabling will be lead covered, paper insulated and unarmoured in the final scheme.

Provision has been made in the concrete on all runways, perimeter and access tracks for the installation of both a temporary lighting scheme and a future permanent lighting scheme. For both schemes, flarepath and taxi lanes on the runways are 150 ft. wide irrespective of the width of runway and on perimeter and access tracks they are the full width of the tracks. The temporary flarepath now being installed in the runways has a lighting spacing at this width of 240 ft. with taxi lights spaced at 160 ft. The light fitting in each case is a simple malleable iron dome with suitable apertures and the light source is a standard 15 w. B. C. lamp supplied at 230 v. on a constant voltage system with provision for dimming control.

The cable used is a fairly heavy cross section copper conductor with tough rubber covering. Connections from the lighting fittings to the supply cable are made in cast iron compound filled boxes housed in the concrete pit adjoining the light position. Landing light flarepath circuits are arranged to be fed in two halves, one from each end of the runway and taxi light circuits are sectionalised to suit traffic routing. In addition to this temporary arrangement a flarepath with fittings giving all round visibility has been installed along the outer edges of the runway. These lights are placed at 100 yd. intervals on the runway.

The future flarepath will consist of a special two directional light fitting which is combined in the precast concrete blocks already installed in the runway at intervals of 40 ft. These fittings will be supplied on a constant current system with the advantage of being able to use a more robust lamp in the limited size of fitting and being independent of volt drop ensuring constancy of light intensity along the entire length of the runway. Lights will be arranged on alternate circuits so that if one circuit is dead lights will show at double space. As independent transformers are not being used, shorting plugs have been provided. Dimming control will be provided.

[Continued on page 114]

Electronic Speed

Electronic circuits provide more efficient, flexible and effective speed control of wound-rotor motors. System applicable to printing, graphic arts and machine tool industries.

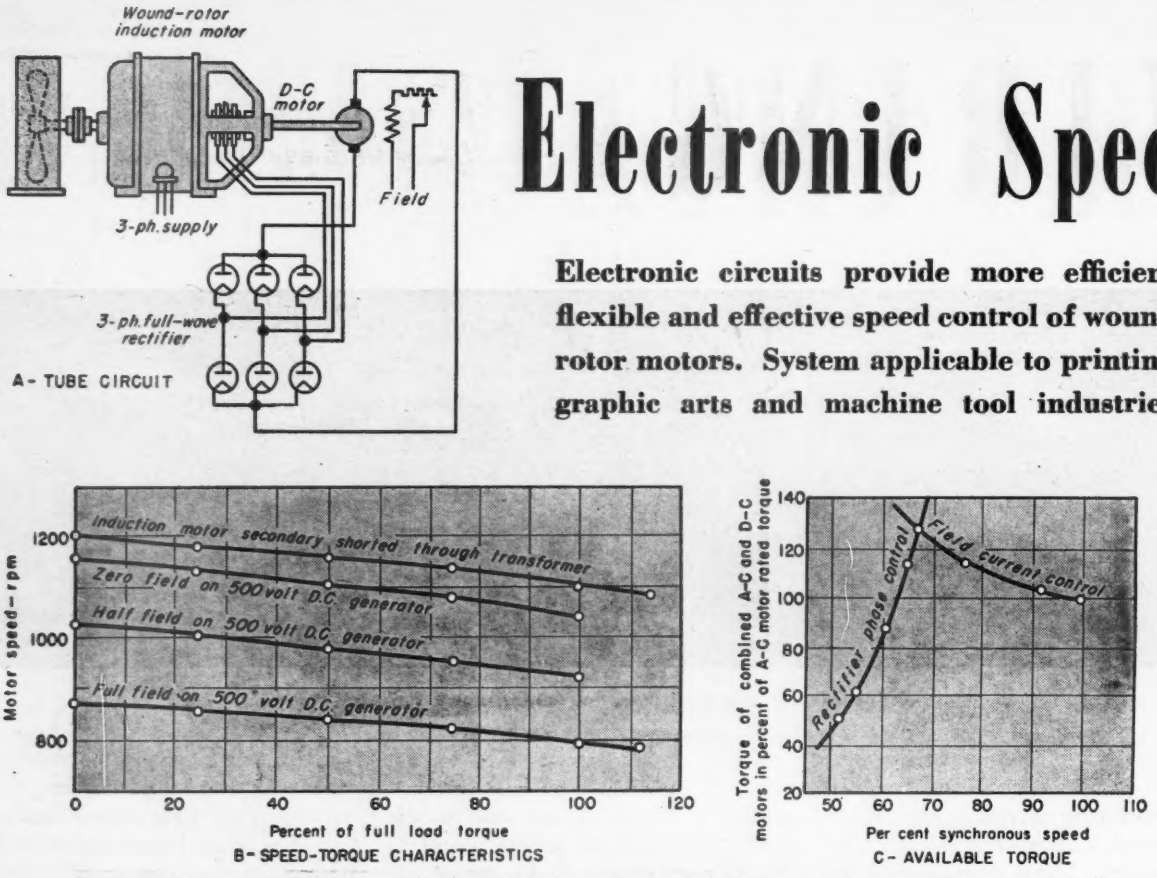


FIG. 1—Rectifier speed control for a wound-rotor induction motor. Tube circuit (A) is the electronic counterpart of a Kraemer drive; speed-torque curve (B) is for 25 hp. motor; curve (C) is for grid controlled rectifier.

WHERE adjustability of speed is required in a-c motor applications, wide acceptance has been given the wound-rotor motor, an induction motor having distributed-polar or phase-wound stator and rotor windings. Through stationary brushes in contact with slip rings (connected to rotor winding terminals) any desired value of impedance may be added to the secondary circuits. With a definite speed-torque characteristic for any given secondary impedance value, the motor can be operated anywhere from zero speed to practically synchronous speed and from zero torque to a maximum depending upon the motor design. This unit has the highest torque efficiency (ratio of developed torque in percent of full load torque to the motor current drawn in percent of full load current) of any a-c motor.

Disadvantages inherent in the wound-rotor motor are the high regulation and low efficiency in the lower speed range because of the amount of power dissipated in the relatively large amount of secondary resistance (the slip energy).

To overcome high regulation at lower speeds, undesirable and frequently intolerable in many applications, automatic regulation of secondary resistance in response to the speed of the drive is employed. This may be done by using a tachometer generator on one of the driven shafts to provide a voltage which is proportional to the speed. This voltage is compared with a reference voltage which determines the speed of the drive. The amplified difference between these voltages is made to operate relays which control the operation of a pilot motor which, in turn, drives the face plate secondary regulator to insert the correct amount of secondary resistance required to maintain the preset speed.

Hunting can be controlled by the introduction of an anti-hunting voltage

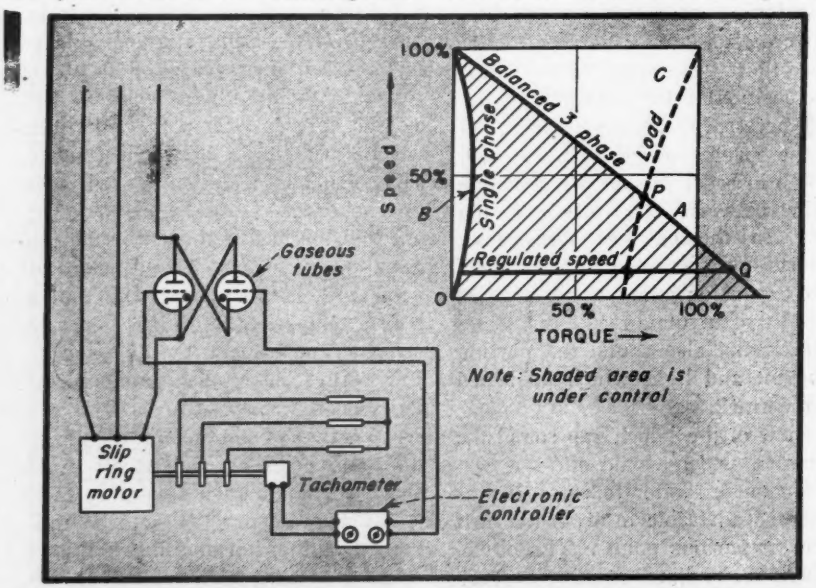


FIG. 2—Speed of wound-rotor motor can be maintained at predetermined value by use of the electronic unbalanced primary control system. Diagram shows gaseous electron tubes in one primary phase which act with tachometer generator and control circuit to produce result shown in curves.

Control of Wound-Rotor Motors

By William H. Elliot
Supervising Electronics Engineer
Cutler-Hammer, Inc.
Milwaukee, Wisconsin

in series with the tachometer generator voltage of one polarity during acceleration and the opposite polarity during deceleration; thus, in effect, the proper position of the regulator arm is anticipated and over-shooting is avoided. By adjusting this voltage in magnitude, the system may be matched to drives of widely varying inertias.

Since the response of a pilot-motor-driven regulator is not instantaneous, this control is more applicable to drives where speed changes are less frequent than those encountered in machine tools where rapid response to frequent speed changes is necessary. Application ranges from one to 200 horsepower. Since the tachometer and relay unit are essentially the same for all sizes of drives, the cost difference between electronic and standard pushbutton control is a minimum in the higher ratings.

Electronics have been employed in an attempt to overcome the high regulation and low efficiency previously mentioned. Vacuum tubes may be used in the control circuits only, in power circuits to handle motor currents directly, or in both.

Rectifier Speed Control

To improve wound-rotor motor drive efficiency, several non-electronic systems have been designed which replace the external secondary resistance by a source of constant and adjustable voltage having the same magnitude, phase, and frequency as the voltage across the external resistance of the wound-rotor motor. Most popular of these are the Scherbius and Kraemer drives.

The electronc counterpart of a Kraemer drive is the circuit shown in Figure 1. Here the output of the secondary is fed through a three-phase, full-wave rectifier into the armature of a d-c shunt motor. The motor may

(Continued on page 180)

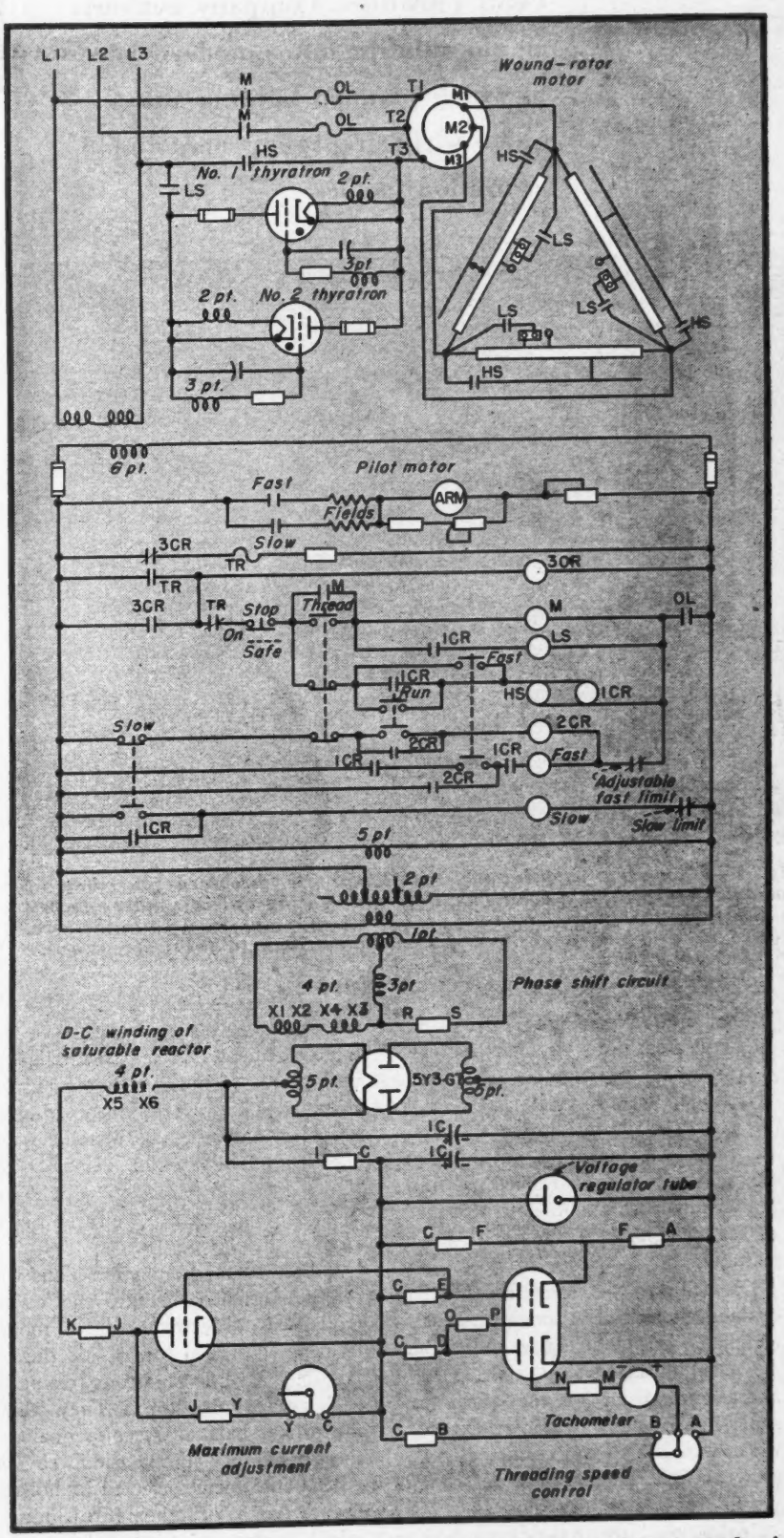


FIG. 3—Elementary diagram showing circuits for electronic control of wound-rotor motor where slow threading speeds are desired.

MODERNIZATION FEATURES

Penn Furniture Company converts an old building into a modern store, in which planned lighting and adequate wiring represent major modernization factors.

By Berlon C. Cooper

Fig. 1—Fluorescent and incandescent lamps are combined in ceiling of main floor to provide a color quality to the lighting which is most effective in displaying furniture. Two rows of fluorescent lamps are used in the cove, created by dropping a portion of the main ceiling to form an attractive architectural effect.

Fig. 2—China and glassware department on main floor is effectively lighted by shielded fluorescent luminaires and louvered direct lighting incandescent luminaires.

THE new Penn Furniture Company store in Altoona, Pennsylvania, is an example of present day modernization at its best. It is the result of alterations to an old 3-story building and an adjoining 5-story building to form a well-integrated furniture establishment, modern in its design and functional in its planning.

Located on a side street off the main business section of Altoona, the architect has made double use of lighting. A well-illuminated sign, spilling light across the front of the store, and super-lighted show windows extend a warm welcome to main streeters. The glow of light from this store front is visible for many city blocks.

Inside the store, lighting plays a major role. It provides light for selling and forms a part of the decorative treatment. Incandescent lighting units, recessed in the ceiling or surface installed; fluorescent lines of light, recessed and surface installed; cove lighting; and special display niche lighting, all combine to provide the most suitable lighting effects for the various displays.

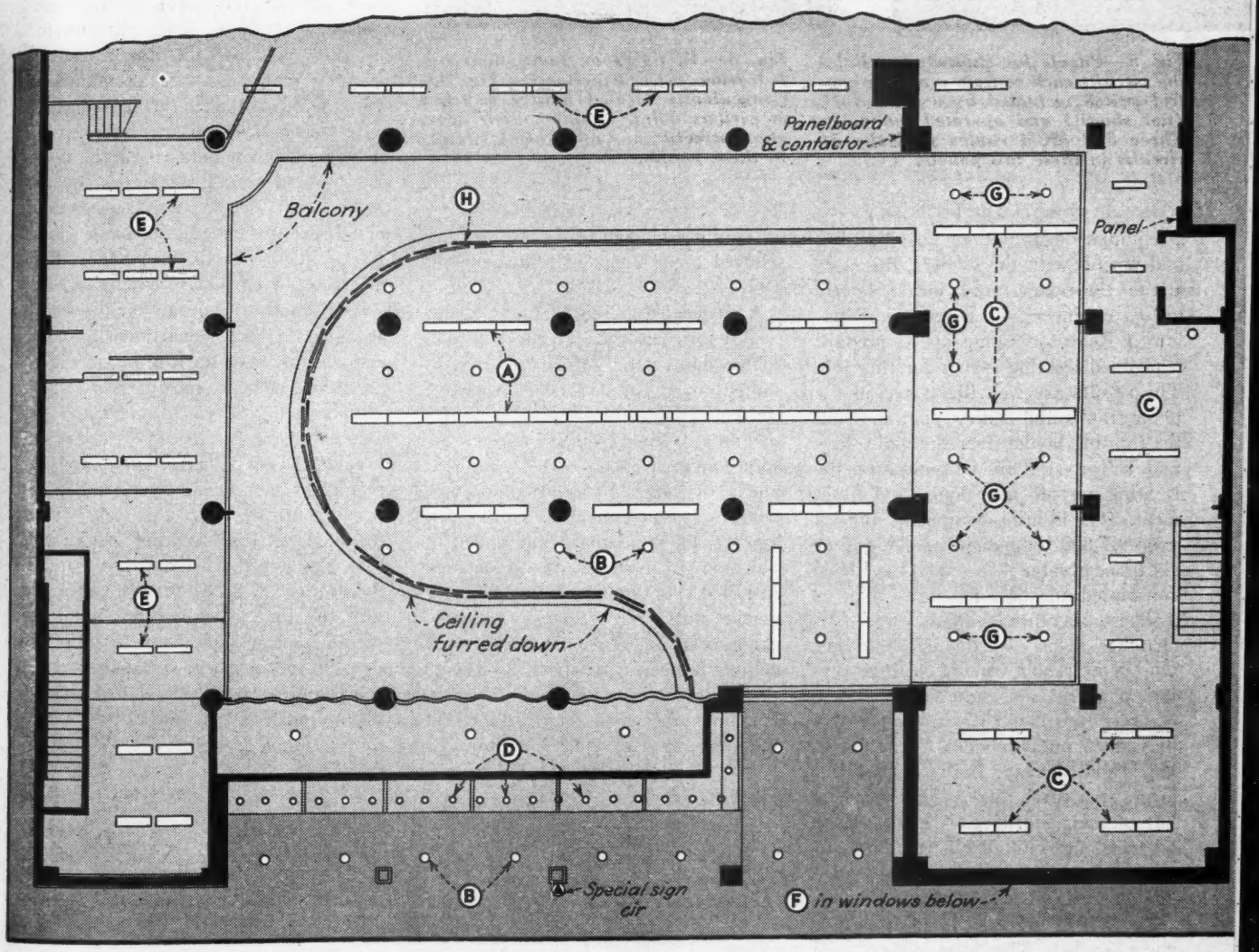
When the modernization plans were in the formative stage, the owners expressed a desire to have modern lighting, designed to provide the best possible specific lighting result for each area of the store. They wanted the proper balance in color quality of the resultant illumination so that when customers selected upholstery, drapes, rugs, or other furnishings in which color selection is important, the colors would appear the same on the sales floor as when the customer viewed the merchandise after getting it home. This, the owners knew, would create satisfied customers, build confidence in the store, and prevent returns of merchandise due to improper color matching.

Another desire of the owners was to have adequate wiring with ample flexibility in switching. This would permit the lighting to operate at maximum efficiency, and enable salesmen to be able to display the merchandise under selected lighting.

The architect for this job was Harry H. Lefkowitz, Architect-Designer, Pittsburgh, Pa. An outstanding store designer, with many furniture stores throughout Pennsylvania to his credit, he believes that each project must have its own solution. After

LIGHTING

Fig. 3—High intensity window lighting features the Penn Furniture Company's new store. Located off the business center in Altoona, Pennsylvania, light is used dramatically and effectively to attract customers to its new location.



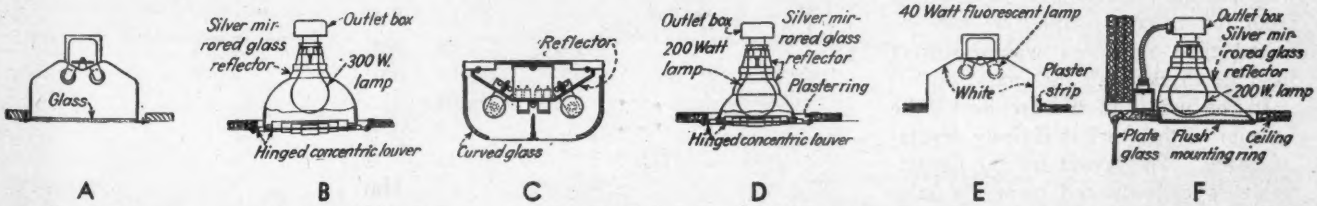


Fig. 4—Partial floor plan showing lighting layout over balcony and main floor, and details of some of the lighting fixtures. A—two-lamp flush troffer unit, glass enclosed. B—flush incandescent louvered unit for 300 watt lamp. C—two-lamp surface installed fluorescent unit. D—flush installed concentrated reflector with louver, used over glass top of show windows below. E—open troffer for two rows of fluorescent lamps. F—asymmetric shaped silver mirrored glass reflectors are spaced 16 inches on centers in show windows (outlets not shown). G—suspended incandescent unit with 300 watt lamp in silver mirrored glass reflector (no sketch). H—fluorescent cove.

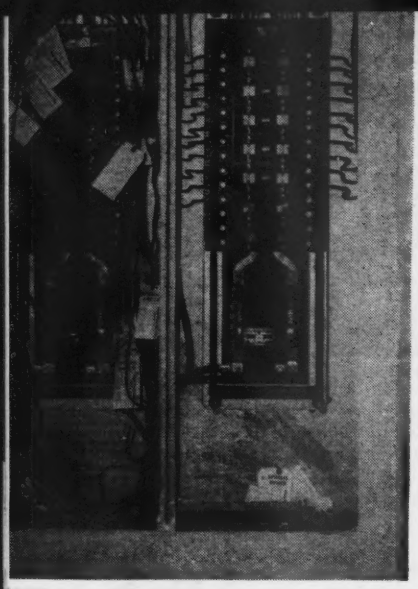


Fig. 5—Panels for showwindow lighting circuits each contain a remote control switch, actuated by a time clock (not shown) and operated manually. Three 500 MCM cables feed the 56 circuits in these two panels.

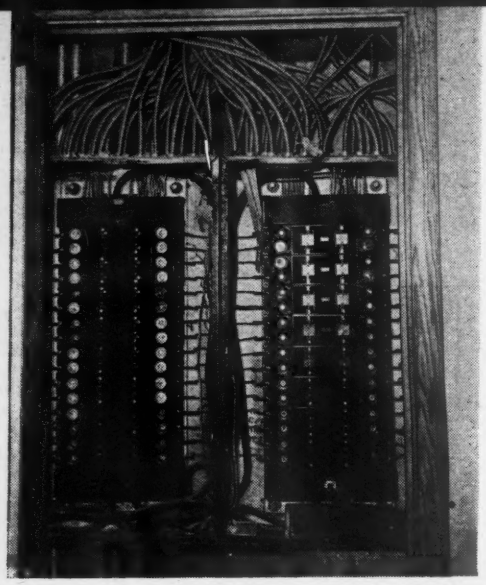


Fig. 6—All lights on main floor are fed from these panels (See Fig. 4). Conveniently located master switches at various points on main floor operate contractor, and all lighting circuits in these panels.

preliminary discussions of lighting and wiring with the owners, the electrical contractor, and local electric utility engineers, he asked the Pittsburgh Reflector Company to prepare a planned lighting layout for this job. The results are well illustrated in the photographs and ceiling plan showing the lighting layout over the main floor and balcony. This is typical of the lighting on all five floors and basement. The lighting equipment sold for over $17,000 for this job, some five or six times greater than would have been considered adequate ten years ago.

There are three windows for merchandise display at the building line. One is a circular window with revolving platform, at right of main entrance. It is flanked by a shallow display area on two sides. Another is an island display, built around two large structural piers. The third, at left of main entrance, is a glass case, 60 feet long without obstructions, and resembling a show case in appearance. Asymmetric silver mirrored glass reflectors with louvers are used to light these cases. The long island case, with partial glass top, is also lighted from the balcony ceiling by concentrated type reflectors which project light down through the glass top.

In the words of the architect, "the interior of the store is entirely departmentized. The layout for the departments was predicated upon the sales volume and the importance of each item to the whole."

The lighting for each department has been considered as a separate lighting problem, and light sources, types of equipment, and location of units selected to provide the lighting result desired.

A suspended ceiling shaped geometrically forms an architectural element on the main floor. Cove lighting, installed around the perimeter of this element, accents it and adds a decorative note. Recessed in this element are both louvered incandescent units and lines of glass-enclosed fluorescent troffers. Open troffers with metal louvers are used over and under the balcony. Combinations of surface-installed continuous rows of fluorescent units and surface installed incandescent units are used where the ceiling is not furred down. Thus, the resultant illumination over any area combines the coolness of fluorescent with the sparkle and warmth of incandescent, providing a color quality which is ideal for accurate color perception and matching.

The wiring for this job is all new. The old panel board in the old 3-story building was replaced with a new panel adequate to handle both buildings. A new panel board was installed on each floor, of size adequate to service all equipment on the floor, fed by three 500 MCM cables from the main panel in basement. A separate panel was installed on the first floor to service the show window lighting. No. 12 wire was used for all branch circuits. Each panel is equipped with a contactor, operated by master switches from several convenient control locations on each floor. The contactor for the show window panel is controlled by time clock as well as manually. This feature makes it possible to leave the lighting on any floor turned off when no customers are on the floor, and to turn on all the lights for the floor from a master push-button switch located at the elevator door. The lights can again be turned off by the same switch when leaving.

Additional switching facilities are provided in each department, so that the salesman can turn on or off either the fluorescent or incandescent light-illumination desired for viewing any merchandise.

G. A. Reger Electric Company, Altoona, Pennsylvania, were the electrical contractors on this job. They installed all the lighting equipment, and planned the wiring for the full flexibility which has been incorporated into the job, to assure maximum use of the lighting equipment to serve the owners and please the customers. All merchandise is thus well displayed, with emphasis on suggestive selling and customer comfort.

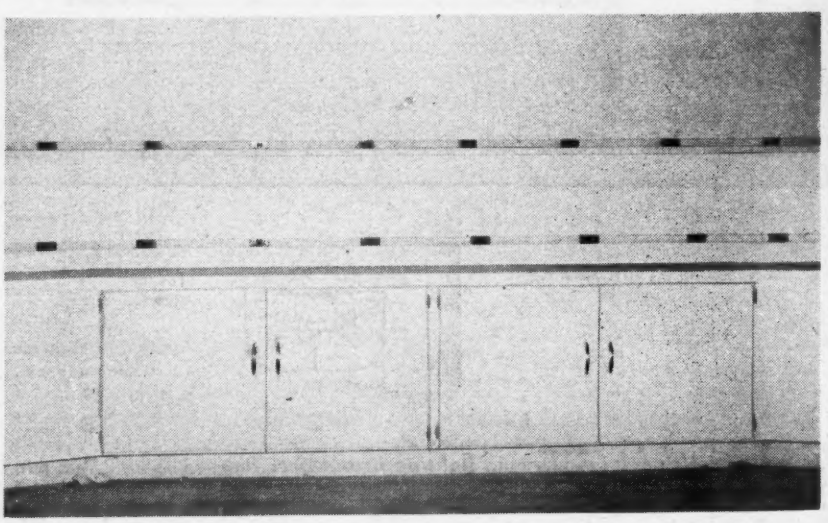


Fig. 7—Counters in electrical appliance and lamp departments are generously provided with electrical outlets in surface raceways.

this is PLANNED ECONOMY Westinghouse Bus Duct

OPENINGS EASILY ACCESSIBLE —Spring-held access covers slide aside easily for access to Prestite-insulated plug-in opening. Cover remains on bus duct.

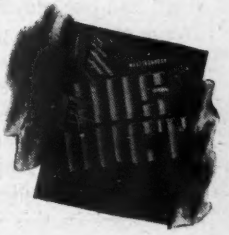
Planned flexibility for the future puts this large manufacturing plant on a fighting basis with the keenest competition. Changes in manufacturing technique or the manufacture of a new product may call for extensive relocation and addition of machinery. Such changes can be met faster... with less work ... with resulting economy if power is carried by a bus duct system.

Westinghouse Bus Duct comes in ten-foot sections and requires only wrench, screw driver and block and tackle for its installation. An exclusive Westinghouse feature is a cantilever hanger which slides to position, making it unnecessary to line up a fixed hanger with a fixed support overhead.

There's a plug-in opening every twelve inches, alternating from side to side. Plug-in openings are insulated with Prestite, which also insulates and supports the busbars. Prestite is an exclusive Westinghouse product ...a wet process porcelain of high dielectric and mechanical strength. Exclusive four-channel housing design makes Westinghouse the strongest of all bus duct construction.

Put your bus duct problems up to Westinghouse Bus Duct Engineers. Call your nearest Westinghouse distributor, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60636

Ask your Westinghouse Distributor, or write for your copy of Booklet B-3714. It gives you complete information for applying bus duct to your power distribution job.



Westinghouse
PLANTS IN 25 CITIES ... OFFICES EVERYWHERE

BUS DUCT

BRIEF ARTICLES about practical methods of installation and maintaining electrical wiring and equipment and up-to-date estimating and office practices. Readers are invited to contribute items from their experience to this department. All articles used will be paid for.

Practical Methods

Band Saw Reduces Metal Cutting Time

One of the significant labor items in heavy electrical construction work is that involved in cutting conduit and various steel framing members, particularly in the larger sizes. Hand tools such as the hack saw and pipe cutter suffice on small jobs where relatively few cuts are made. On larger projects, where considerable quantities of material must be fabricated, power tools are a "must" item. Many contractors use cutting attachments on their pipe threading machines for conduit work and the reciprocating power hack saw for other steel and metal sections.

Other contractors, like Hall Engineering Company of Detroit, favor the metal cutting band saw illustrated in Fig. 1. Advantages of this particular unit are—it will cut both pipe and other metal structural members up to 8 inches in height and 16 inches in width; the continuous uni-directional movement of the band saw cuts metal about ten times faster than the reciprocating power hack saw; by merely changing blades, either steel, cast iron, brass, copper, bronze or aluminum can be cut with equal ease.

Popularity of the metal cutting band saw in the Hall firm, which lists some 14 units in its equipment inventory, is evidenced by the fact that men on the construction projects request more than one unit on each job. The economies in construction time and labor more than offset the monetary investment in the equipment, according to contractor estimates.

The unit illustrated, the Kalamazoo Band Saw, is one of numerous machines on the market today. It features an adjustable work vise (one fixed and one movable jaw); hydraulic frame control (to prevent sudden drop of saw blade on work and to control downward pressure); guide bars with rollers and brushes (Fig. 2) to control saw blade at cutting points; blade tension control; multiple blade speed through step-pulley at motor. The band used in this particular unit is a

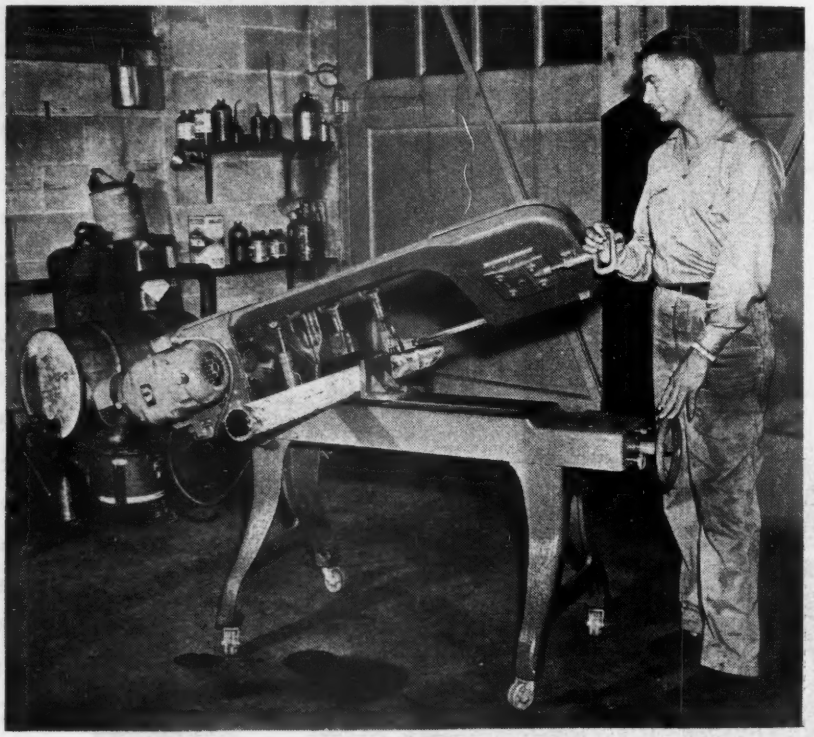


FIG. 1—Mechanic cuts a section of 3½-in. conduit with metal cutting band saw in the Hall Engineering Company shop in Detroit. His left hand is on work vise adjustment wheel; right hand on cutting frame handle (and initial band tension adjustment). Note hydraulic piston (just to left of vise) to control downward pressure of band frame.

FIG. 2—Close-up view of saw blade guide and work vise. Large wheel at right turns band and is driven, through gear and pulley arrangement, by motor directly behind it. Lever on fore leg of unit adjusts blade tension for cutting various thickness of stock.

FIG. 3—Band saw cutting frame with cover open to show internal mechanism. To replace blades, band tension is released by turning frame handle (top, left) in front of idle wheel; blade is removed; a new one inserted and tension restored.

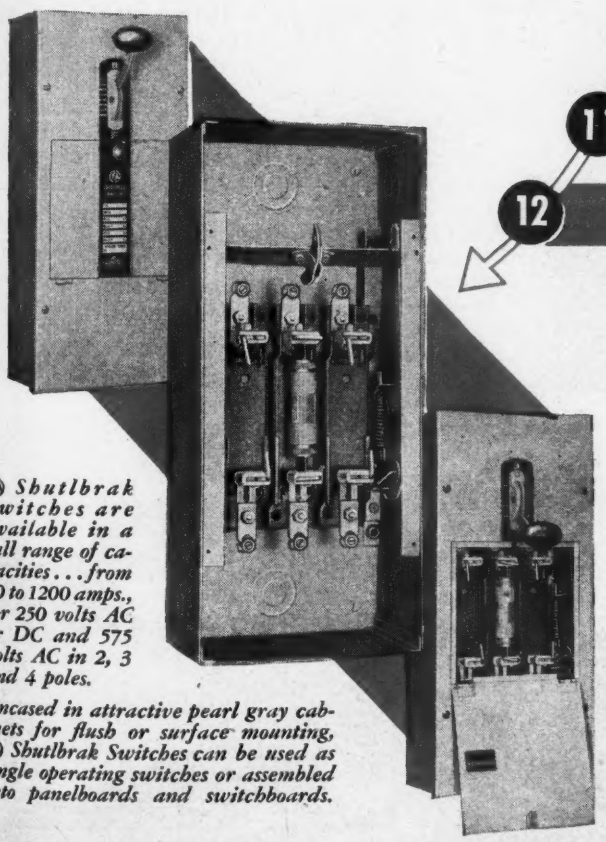
At Least a

Dozen Reasons

WHY YOU'LL LIKE FA SHUTLBRAK ENCLOSED SAFETY-TYPE SWITCHES

There are many reasons for the mounting popularity of FA Shutlbrak Switches. Some say, for instance, they like its easier, split-second speed of operation . . . its new shuttle mechanism feature that gives quick make and break connections. Others say it is the simplicity of design that appeals to them . . . ample knockouts and wiring space at top, bottom and back. Still others say it is its trouble-free service and many practical safety features . . . its long lasting economical operation.

1. Positive Make and Break
2. Silver-Plated Contacts
3. Front Operation
4. Attractive Finish
5. Removable Switch Unit
6. Interlocking Fuse Doors
7. Kamklamp Fuse Holders
8. Full Range of Capacities
9. Solderless Pressure Connectors
10. Ample Wiring Space and Knockouts
11. Approved By Underwriters' Laboratories
12. Versatility: Individual or Panelboard and Switchboard Assemblies



FA Shutlbrak Switches are available in a full range of capacities . . . from 30 to 1200 amps., for 250 volts AC or DC and 575 volts AC in 2, 3 and 4 poles.

Encased in attractive pearl gray cabinets for flush or surface mounting, FA Shutlbrak Switches can be used as single operating switches or assembled into panelboards and switchboards.

Whatever the reason, the fact remains that FA Shutlbrak Switches embody the latest in design and construction, making them the popular choice for high quality, heavy duty switching. So the next time you need a good operating switch, ask your dealer to show you an FA Shutlbrak or send for our 20-page Bulletin No. 70.

If it's FA it's "OK"

MAKERS OF . . .
BUSDUCT
PANELBOARDS
SWITCHBOARDS

Frank Adam
ELECTRIC COMPANY
St. Louis, Missouri

SERVICE EQUIPMENT
SAFETY SWITCHES
LOAD CENTERS
ELECTRIC QUIKHETER

10-ft., 5-in. by ¾-in. saw which goes around a driver and idle band wheel (Fig. 3).

To operate, the work is placed in the vise on the machine bed; the hydraulic frame control adjusted for proper cut by turning a knob at the front end of the unit (⅛ turn for ⅛ inch walls; ¼ turn for ¼ inch walls; ½ turn for ½ inch thick walls and all larger solid sections). The motor is then turned on and the frame lowered gently by hand until the saw teeth enter the stock. The hand is then released and the machine automatically completes the cut and shuts itself off. A cam arrangement on the right leg of the unit, near the driver wheel, provides change of blade pressure. Lowering the handle gives the proper tension for cutting tubing and light stock; raising it sets the blade for heavy cuts and to maintain cutting speed as the blade becomes dull. The work vise can also be adjusted for making angle cuts on metal stock.

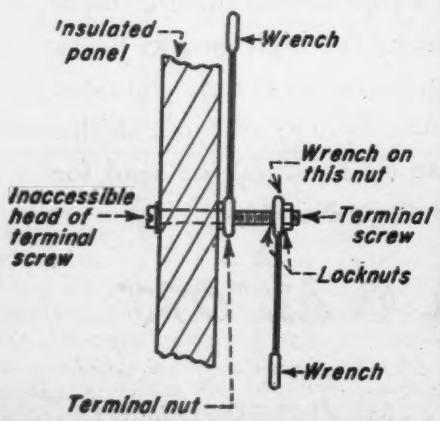
The entire unit is mounted on heavy industrial casters for mobility. It can be easily loaded on a truck and moved around a project where needed.

Locknuts Prevent Bolt Rotation

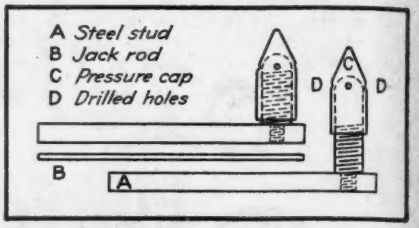
INSTALLATION

In construction and installation work it is often necessary or desirable to insert long-shanked terminal screws or bolts through partitions or walls and secure them by running terminal nuts down to the penetrated surface. In many cases it is either difficult or impossible to hold the inaccessible bolt head steady with a screwdriver or wrench to prevent the bolt from revolving during this operation. Thomas Trail of Baltimore, Md., suggests that this difficulty may be overcome by applying the principle illustrated.

The terminal nut which is to bind the bolt is spun along the bolt shank until it comes in contact with the insulated panel or partition. Two additional locknuts are then slipped over the bolt and jammed together by simultaneously rotating them in opposite directions. Wrenches are then fitted around the terminal nut and the first of the two locknuts, the bolt is prevented from rotating by holding the locknut wrench steady and the terminal nut is tightened with the other wrench used in the usual manner.



Terminal screw or long-shanked bolt with inaccessible head is prevented from rotating during tightening of terminal nut by action of a holding wrench and two jammed locknuts.



Pocket-sized jackscrew removes knockouts from junction, switch and outlet boxes without disturbing mounting straps, cracking surrounding plaster or loosening supporting screws. Pressure cap (C) is turned by inserting nail or jack rod (B) into one of four drilled holes (D). Cap moves outwards away from the steel stud (A) and pressure is gradually applied to the knockout which is forced out of the box side.

Jackscrew Removes Knockouts

WIRING

Outlet, switch and junction boxes are often permanently or semi-permanently installed before a completed circuit layout has been formulated. Due to this fact as well as to the revamping or additions of circuits, it is often necessary to remove knockouts after the boxes have been set in place. When knockouts are removed by placing a nail punch or screwdriver against them and striking the tool with a hammer or mallet, the screws holding the boxes are often loosened or bent, the boxes are jarred out of alignment and surrounding plaster is cracked or chipped. An easily made tool, small enough to slip into the pocket of the maintenance man or installation electrician, eliminates these disadvantages and creates the desired opening in the sides of the boxes quickly, easily and without disturbing any of the mounting strips.

The tool is a pocket-sized version of the jackscrew and operates on the same principle to exert force on the perforated lip of the knockouts. A steel stud (¼ to ¾ by 3½ inches) is tapped and threaded at one end to receive the reduced shaft of a ⅜ inch bolt which,

A taut wire strung across the wall and metal spring clips keep reference blue prints always before electrical estimators at the Hall Engineering Company in Detroit. Estimators find this scheme particularly helpful when making frequent reference to architectural drawings for riser heights, building construction details and other data.

Performance Plus

Type A Heavy Duty Industrial Safety Switch — one of a complete line of Square D safety switches available in a wide range of sizes and enclosures

with SQUARE D Safety Switches

Positive pressure fuse clips effect 60% reduction in heating of fuse clip contacts. Multi-spring jaws assure uniformly distributed contact pressure. Square D quick-make and quick-break mechanism eliminates dead center. Arc suppressors (supplied on switches rated above 250 volts) increase rupturing capacity by 500% or more. And—completeness of line means the right switch for any given application.

Wherever Electricity is Distributed and Controlled

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

10-ft., 5-in. by ¾-in. saw which goes around a driver and idle band wheel (Fig. 3).

To operate, the work is placed in the vise on the machine bed; the hydraulic frame control adjusted for proper cut by turning a knob at the front end of the unit (⅛ turn for ⅛ inch walls; ¼ turn for ¼ inch walls; ½ turn for ½ inch thick walls and all larger solid sections). The motor is then turned on and the frame lowered gently by hand until the saw teeth enter the stock. The hand is then released and the machine automatically completes the cut and shuts itself off. A cam arrangement on the right leg of the unit, near the driver wheel, provides change of blade pressure. Lowering the handle gives the proper tension for cutting tubing and light stock; raising it sets the blade for heavy cuts and to maintain cutting speed as the blade becomes dull. The work vise can also be adjusted for making angle cuts on metal stock.

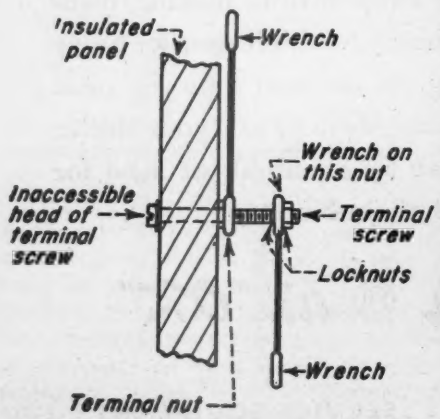
The entire unit is mounted on heavy industrial casters for mobility. It can be easily loaded on a truck and moved around a project where needed.

Locknuts Prevent Bolt Rotation

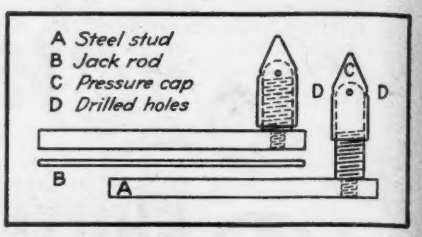
INSTALLATION

In construction and installation work it is often necessary or desirable to insert long-shanked terminal screws or bolts through partitions or walls and secure them by running terminal nuts down to the penetrated surface. In many cases it is either difficult or impossible to hold the inaccessible bolt head steady with a screwdriver or wrench to prevent the bolt from revolving during this operation. Thomas Trail of Baltimore, Md., suggests that this difficulty may be overcome by applying the principle illustrated.

The terminal nut which is to bind the bolt is spun along the bolt shank until it comes in contact with the insulated panel or partition. Two additional locknuts are then slipped over the bolt and jammed together by simultaneously rotating them in opposite directions. Wrenches are then fitted around the terminal nut and the first of the two locknuts, the bolt is prevented from rotating by holding the locknut wrench steady and the terminal nut is tightened with the other wrench used in the usual manner.



Terminal screw or long-shanked bolt with inaccessible head is prevented from rotating during tightening of terminal nut by action of a holding wrench and two jammed locknuts.



Pocket-sized jackscrew removes knockouts from junction, switch and outlet boxes without disturbing mounting straps, cracking surrounding plaster or loosening supporting screws. Pressure cap (C) is turned by inserting nail or jack rod (B) into one of four drilled holes (D). Cap moves outwards away from the steel stud (A) and pressure is gradually applied to the knockout which is forced out of the box side.

Jackscrew Removes Knockouts

WIRING

Outlet, switch and junction boxes are often permanently or semi-permanently installed before a completed circuit layout has been formulated. Due to this fact as well as to the revamping or additions of circuits, it is often necessary to remove knockouts after the boxes have been set in place. When knockouts are removed by placing a nail punch or screwdriver against them and striking the tool with a hammer or mallet, the screws holding the boxes are often loosened or bent, the boxes are jarred out of alignment and surrounding plaster is cracked or chipped. An easily made tool, small enough to slip into the pocket of the maintenance man or installation electrician, eliminates these disadvantages and creates the desired opening in the sides of the boxes quickly, easily and without disturbing any of the mounting strips.

The tool is a pocket-sized version of the jackscrew and operates on the same principle to exert force on the perforated lip of the knockouts. A steel stud (¼ to ¾ by 3½ inches) is tapped and threaded at one end to receive the reduced shaft of a ⅜ inch bolt which,

A taut wire strung across the wall and metal spring clips keep reference blue prints always before electrical estimators at the Hall Engineering Company in Detroit. Estimators find this scheme particularly helpful when making frequent reference to architectural drawings for riser heights, building construction details and other data.

Performance Plus

Type A Heavy Duty Industrial Safety Switch — one of a complete line of Square D safety switches available in a wide range of sizes and enclosures

with SQUARE D Safety Switches

Positive pressure fuse clips effect 60% reduction in heating of fuse clip contacts. Multi-spring jaws assure uniformly distributed contact pressure. Square D quick-make and quick-break mechanism eliminates dead center. Arc suppressors (supplied on switches rated above 250 volts) increase rupturing capacity by 500% or more. And—completeness of line means the right switch for any given application.

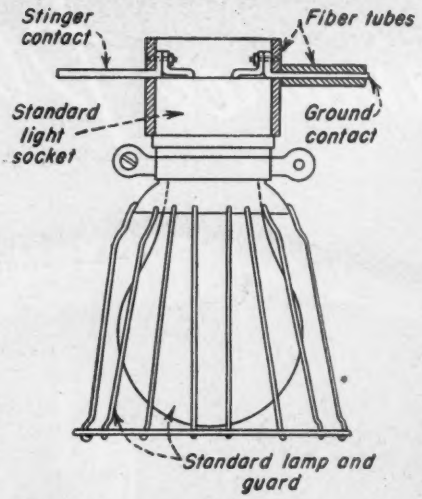
Wherever Electricity is Distributed and Controlled

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

when in position, protrudes from the stud ½ inch. From a 1¼ inch section of ½ inch steel round stock, a pressure cap is fashioned, similar in appearance to the nose of a bullet. The pressure cap is tapped and threaded to fit over the ⅜ inch bolt and this cap is rotated by means of a nail or ⅛ inch steel jack rod which is inserted into any of four holes drilled through the shoulder of the cap.

In operation, the pressure cap is turned so that its base fits snugly against the steel stud. In this position the overall dimension from tip of cap to back of stud is 1½ inches and it is possible to insert the device into any standard junction, switch or outlet box. The jack rod is then inserted in one of the drilled cap holes and, by turning or jacking, the cap moves outwards and, with the stud bearing on the side of the box opposite the knockout being removed, the cap forces the knockout outward to the breaking point.



Light for traveling from one location to another is supplied to welders in double bottoms of ships by the assembly illustrated. A stinger contact inserted in the jaws of a welding stinger draws between 50 and 70 volts for the standard lamp. The insulated ground contact is slid along the steel surface of the ship. The assembly eliminates a special cable for lighting purposes, saves both labor and material.

Welding Stinger Supplies Light

INDUSTRIAL

Due to the great shortage of light cord used by welders, the Electrical Maintenance Department of the Marinship Corporation, Sausalito, Calif., found it difficult to provide the necessary working lights to their workers. The procedure usually practiced by the welders was to crawl through the bottom of the ships, pulling both the welding cables and the lighting cables after them. A suggestion submitted to the company by James L. Butler, one of the employees, made it possible to eliminate the lighting cables and show a definite saving in this scarce item as well as a reduction in labor involved.

The suggestion discussed and illustrated takes advantage of the light of the arc and the current of from 50 to 70 volts which emanates from the welding machine. A standard lamp guard, containing a standard 110-volt lamp, is fastened to a standard light socket which, in turn, is fastened in a 1½-inch inside diameter fiber tube. A stinger contact of copper is left exposed on one side of this fiber collar and a fiber-covered ground contact fastened on the opposite side.

In operation, the stinger contact is placed in the jaws of the welding stinger and the ground contact is held in contact with any part of the double bottom. The ground can be slid along the steel shell as the welder proceeds from one location to another and the light provided is ample for safe travel. On reaching his working destination, the welder removes the stinger contact, inserts a welding rod and goes to work, working by the light of his arc. There is a momentary period of darkness between the time of removing the stinger contact and striking the arc but the workers can work by touch for this brief interval and, since there is no travel involved in the dark, the danger of injury is negligible.

Compact Unit for Fabricating Bracket

FABRICATION

Efficient shop and field fabrication of angle-iron supporting brackets is accomplished at the Hall Engineering Company, Detroit electrical contracting firm, by the use of a compact fabricating stand embodying a shear, punch and bender. The unit takes up to 2-in. by 2-in. by ¼-in. angle iron and is used primarily for making brackets and hangers for conduits and wall-mounted or free-standing racks for electrical control equipment.

The 18-inch square stand is made of 1-inch angle iron. Mounted to its top, 28 inches above floor level, is a punch and bender to cut out the necessary "V" sections and bend the stock for rack construction. Fastened to a steel channel at the base of the stand is a shear for cutting angle sections to prescribed length. A single bar lever is used to operate the triple-purpose mobile unit.

FIG. 1—First step in using the unit involves cutting the angle-iron to required length with the hand shear.

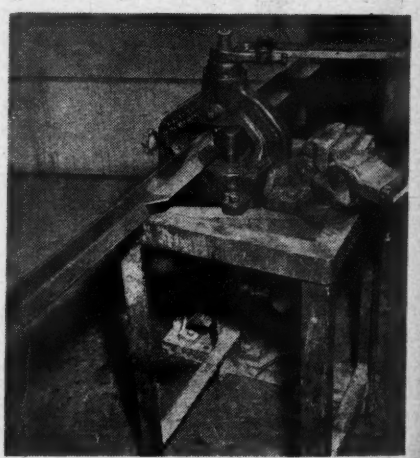
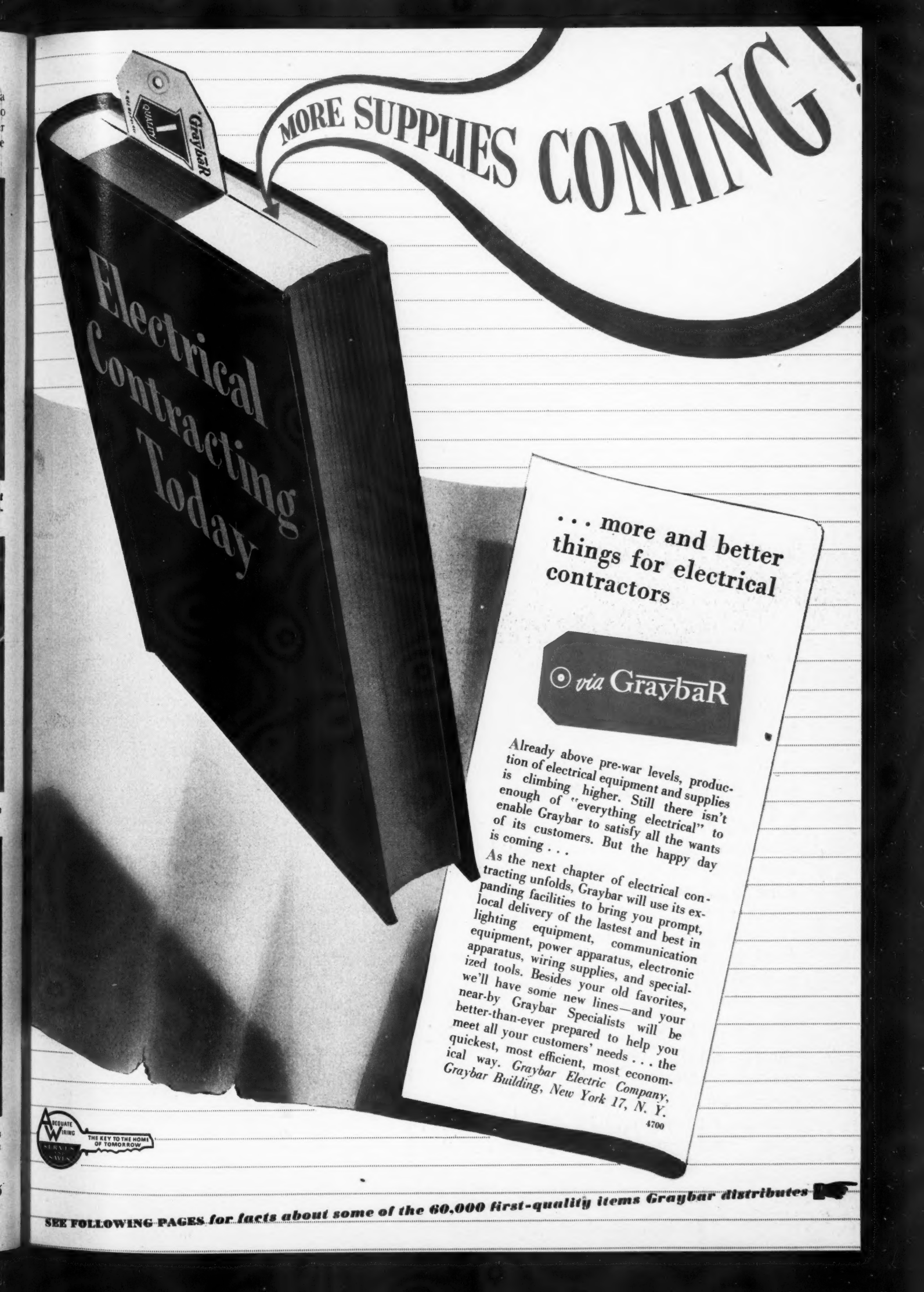


FIG. 2—Punching out the "V" section for bend is the second step.

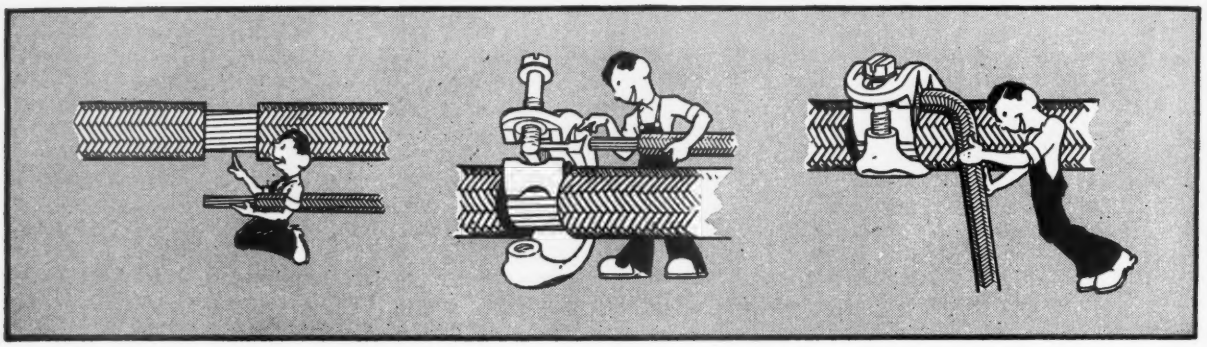
FIG. 3.—Making a 90-degree bend is the third step in fabrication of an equipment rack.


MORE SUPPLIES COMING!
Graybar
Electrical Contracting Today
. . . more and better things for electrical contractors
via GraybaR
Already above pre-war levels, production of electrical equipment and supplies is climbing higher. Still there isn't enough of "everything electrical" to enable Graybar to satisfy all the wants of its customers. But the happy day is coming . . .
As the next chapter of electrical contracting unfolds, Graybar will use its expanding facilities to bring you prompt, local delivery of the lastest and best in lighting equipment, communication equipment, power apparatus, electronic apparatus, wiring supplies, and specialized tools. Besides your old favorites, we'll have some new lines—and your near-by Graybar Specialists will be better-than-ever prepared to help you meet all your customers' needs . . . the quickest, most efficient, most economical way. Graybar Electric Company, Graybar Building, New York 17, N. Y.
4700
ADEQUATE WIRING
THE KEY TO THE HOME OF TOMORROW
SERVES
SEE FOLLOWING PAGES for facts about some of the 60,000 first-quality items Graybar distributes

This TOUGH LITTLE TAP

T&B ENGINEERED

Makes GUTTER WORK A CINCH



HINJON JUNIOR TEE PARALLEL TAP*

Demonstrate for yourself how easily it taps large mains to small branches.

Its compact, streamlined, one-piece construction makes it amazingly easy to install in any position, and easy to tape in hard to get at places. Tight spots where it's more handy to turn a screw driver than operate a bulky wrench. "You don't need three hands". There are no loose parts to spill. And you have the assurance that it is a permanent tap—for as long as you want it.

Simply slip your main into the large powerful self-adjusting jaws, and slip your branch into the small jaws. Tighten the one screw. That's all there is to it. Then bend branch to any position you want.

See for yourself how each cable is held tight by all-round pressures. Pull and haul on your branch for all you are worth. You won't be able to budge it. In other words, it's really vibration proof.

T&B Hinjon Junior Tee Parallel Taps are fully Approved by the Underwriters Laboratories. Each Tap takes a range of cable sizes: mains #8 to 1,000,000 CM to branches #14 to #1. Any type of conductor you may be using.

AVAILABLE NOW. For sale by T&B Electrical Supply Wholesalers through whom all T&B products are distributed exclusively.

*Patented

The Thomas & Betts Co.
INCORPORATED
MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1898
ELIZABETH 1, NEW JERSEY
In Canada: Thomas & Betts Ltd. Montreal

via GraybaR MORE SUPPLIES COMING

BIG NEWS IN 1906...
BIGGER NEWS IN 1946!

The only Propeller Fan with patented *self-cooled motor*

Operates at peak efficiency under exhaust conditions

Of all the exhaust fans on the market, *only ILG* has this exclusive, patented *Self-Cooled Motor!* When fan is operating, clean, cool, fresh air is drawn through vent pipe from OUTSIDE . . . circulated through motor, then exhausted from front of motor. Motor stays clean, cools itself—no foul air reaches it to interrupt service, shorten its life. You get *low operating cost* of open-type motor, plus *protection* of enclosed-type motor. You save 5 to 10% on power cost. You have a fan unit that operates quietly, smoothly, with long life. Get complete data on sizes, types, and capacities today!

FREE—48-PAGE BOOKLET

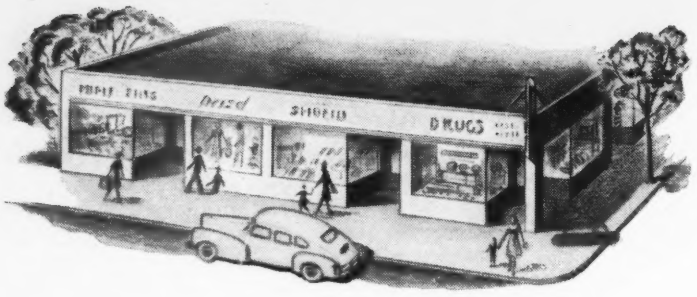
Handy, condensed data book on complete lines of ILG Self-Cooled Motor Propeller Fans, Direct-Connected Centrifugal Fans, Unit Heaters, Unit Coolers. Get yours now!

ILG

VITALIZED VENTILATION
AND AIR CONDITIONING

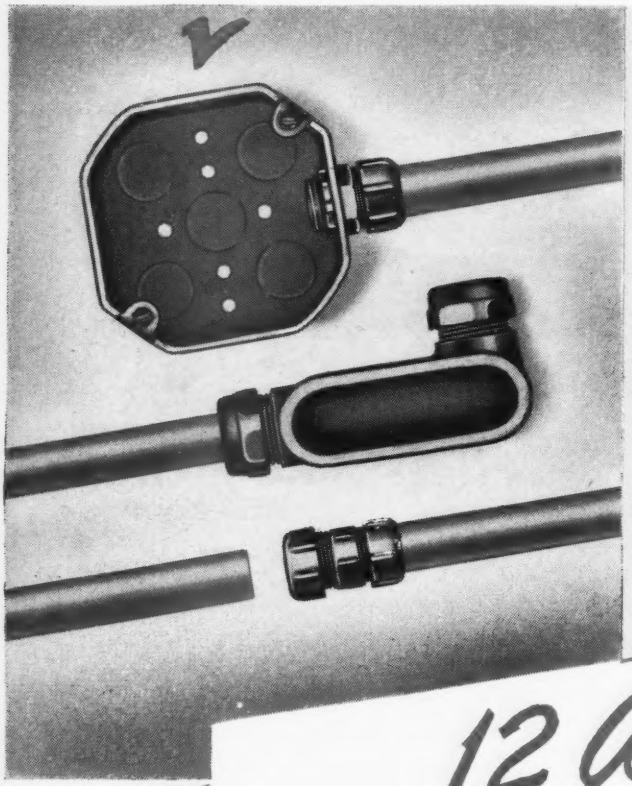
ILG ELECTRIC VENTILATING CO. • 2879 NORTH CRAWFORD AVENUE • CHICAGO 41, ILLINOIS • OFFICES IN MORE THAN 40 PRINCIPAL CITIES

FOR ELECTRICAL CONTRACTORS via GraybaR



FOR STORE WIRING

The Modern Way is



Standard *threadless* fittings . . . in a wide range of sizes, styles and types . . . for use with ELECTRUNITE E.M.T. (Electrical Metallic Tubing) are stocked by your nearest ELECTRUNITE Distributor. Ordinary threaded-type fittings, too, can be used with ELECTRUNITE E.M.T. by adding a simple, one-piece adapter ring.

12 Advantages

1. FULL PROTECTION
2. NO THREAD-CUTTING
3. INCH-MARKING
4. LIGHT WEIGHT
5. EASY TO BEND AND REBEND
6. ✓ STANDARD FITTINGS
7. EASY TO INSTALL
8. UNBROKEN CORROSION-RESISTANCE
9. KNURLED INSIDE SURFACE
10. UNIVERSAL ACCEPTANCE
11. LOW COST
12. WIDESPREAD DISTRIBUTION

via GraybaR

MORE SUPPLIES COMING

the Electrunite Way

NO THREADS TO CUT . . . NO LONG LINES TO TURN . . . WITH MODERN REPUBLIC ELECTRUNITE E. M. T. . . . THE *ORIGINAL* LIGHTWEIGHT RIGID RACEWAY

● Get away from dirty, old-fashioned thread cutting *now,* with easy-to-install Republic ELECTRUNITE E. M. T.—the modern streamlined wiring raceway.

Simple compression-type couplings and connectors eliminate completely the need for thread-cutting, with ELECTRUNITE E. M. T. Just slip the fitting on the end of the tube and tighten with wrench or pliers . . . no need to turn long lengths of tubing.

And because it weighs less than half as much as ordinary threaded-type conduit, ELECTRUNITE E. M. T. is easier to bend and easier to handle —particularly in overhead and other hard to reach locations.

ELECTRUNITE E. M. T. meets safety requirements as established by Underwriters' Laboratories, and is approved by the National Electrical Code for exposed, concealed and concrete slab construction.

For complete information, see your nearest ELECTRUNITE Distributor.

Designed to simplify installation in every type of building construction, ELECTRUNITE E. M. T. is the original *lightweight rigid steel raceway—developed and pioneered by Steel and Tubes Division of Republic Steel Corporation*

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • CLEVELAND 8, OHIO
Export Department: Chrysler Building, New York 17, New York

SEE OUR EXHIBIT
17th National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York, December 2nd to 6th.

Republic
ELECTRUNITE E. M. T.
REG. U. S. PAT. OFF.

LIGHTWEIGHT THR[illegible]ADLESS RIGID STEEL RACEWAY

FOR ELECTRICAL CONTRACTORS via GraybaR

Measure

Protection
OF SMALL MOTORS

in terms of

Production

and you'll install

BUSS FUSETRONS

throughout your electrical system to protect all of them

Here's Proof...

Fusetrons Eliminate Average of Two Motor Burnouts per Month on Fan Motors.

"Steam is exhausted from the rooms where we empty our bone char by exhaust fans of two types—a 36 inch fan operated by ½ h. p. motor and a 24 inch fan operated by ¼ h. p. 3 phase—220 volt motor. The grilles or louvers open to the northeast right over the Delaware River. High winds will therefore sometimes stall the motors and in a very severe storm, the wind may even reverse the direction of the motor while it is running. Also, the starting current is increased greatly when the blades are revolving in the opposite direction, due to high wind.

"Prior to 1942, at least two of these fan motors were replaced every month, due to burnout. Replacement was very difficult and expensive due to the fact that the fans are mounted right below the ceiling and above steam pipes.

"Early in the summer of 1942 we installed 8 ampere Fusetrons for the ½ h. p. motors and 6¼ ampere Fusetrons for the ¼ h. p. motors. Up to August of 1945 we had not had to replace a single fan motor protected by Fusetrons."

David J. Coles, Electrical Engineer,
McCahan Sugar Refining Co.,
Philadelphia, Pa.

Motor Repair Co. Won't Guarantee Motor Rewind Job Unless Motor is Protected by Fusetrons

"We have found Fusetrons and Fustats (Fusetrons with a tamper resisting base for 125v. circuits) so satisfactory for the protection of small motors that for a number of years we have refused to give a warranty with a rewound motor job unless the owner installed a Fusetron or Fustat to protect the motor. We saw to it that the size used would give burnout protection.

"We are convinced that this policy of installing a Fusetron or Fustat to protect all rewound motors has saved us a lot of unjustified complaints—and no one knows how much expense taking care of motors within the warranty period."

A. H. Wolf, Superintendent
of Motor Repair Dept.
Swanson-Nunn Electric Co.
Evansville, Ind.

BUSS FUSETRONS

via GraybaR

MORE SUPPLIES COMING

GET SMALL MOTOR PROTECTION
Simply and Inexpensively

Burnout of motors from lack of oil, worn bearings, tight belt, overloading—or anything that causes a dangerous excess of current through the motor—can, on normal installations, be prevented by Fusetrons.

Just install a Fusetron of motor-running protection size, anywhere in the circuit to handle only the motor current. *That's All.*

If motor is on a separate circuit, install the Fusetron in the switch or panelboard. Then the motor as well as the circuit wiring is protected.

If the motor is on a general use circuit or a circuit feeding more than one motor, protect each motor individually by installing a switch or a fuse block with the proper size Fusetron. *It Is As Simple As That.*

Protect Against Cost of Replacing a Motor—and Against Production or Operating Losses

When pumps, fans, air compressors, blowers, conveyors, mixers, stokers, oil burners, grinders —or any of the hundreds of other circuits on which small motors are used—are out of service because of a motor burnout the losses incurred generally make the cost of Fusetron protection seem mighty small.

You not only have the cost and trouble of removing and replacing the destroyed motor—but all the time the motor is down, production or operating losses pile up.

It's guarding against these double losses that makes it pay you so well, to go to the little expense and trouble necessary to install Fusetrons for the protection of all small motors used throughout your plant or building.

FUSETRONS GIVE MANY OTHER KINDS OF PROTECTION HERETOFORE NOT AVAILABLE

Fusetrons do everything fuses do, as is confirmed by the Underwriters' Laboratories' Label, and in addition . . .

★ Provide simplest way to stop burnouts from single phasing. ★ Entirely wipe out needless blows caused by motor starting currents or other harmless overloads. ★ Give thermal protection to panelboards and switches. ★ Prevent needless blows caused by heating in panels and switches. ★ Permit use of larger motor or adding more motors on circuit without installing larger switch or panel. ★ On new installations proper size switches and panels can be used instead of oversize. Protect motors against burnout. ★ Give double burnout protection to large motors.

What is the FUSETRON?

The Fusetron is a DUAL element device—a Fuse to which is added a Thermal cutout.

The result is a fuse with tremendous time-lag and much less electrical resistance.

Fusetrons have the same degree of Underwriter's Laboratory approval for both motor-running and circuit protection as the most expensive devices made.

Made to the same dimensions as ordinary fuses, Fusetrons fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere in both 250 and 600 volt types. Also in tamper-resisting type (Fustats) for 125 volt circuits.

Their cost is surprisingly low.

Get All the Facts

Get Better Protection—Send the Coupon Now

Even one lost, hard-to-replace motor, or one needless shutdown or destroyed panel may cost you far more than replacing every fuse with a FUSETRON.

Don't risk such losses—protect your production schedules by changing over your entire electrical system to FUSETRONS.

BUSSMANN MFG. COMPANY
University at Jefferson • St. Louis 7, Mo.
(Division McGraw Electric Co.)

BUSSMANN MFG. CO., University at Jefferson · EC-11-46
St. Louis 7, Mo. *(Division McGraw Electric Co.)*

Please send me complete facts about BUSS Fusetrons.

Name_____

Title_____

Company_____

Address_____

City_____ State_____

Sold through Wholesalers

FOR ELECTRICAL CONTRACTORS *via* GraybaR

MODERNIZE

WITH

HUBBELL

Twist-Lock

LOCKING CONNECTORS

• • •

Twist-Lock **Connecting Devices are widely used by industries *wherever lockfast electrical connections are needed* to insure safe, uninterrupted production.**

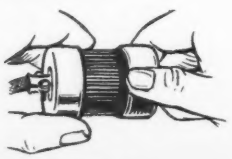
Illustrating Contact Blade locked under thick ledge of Bakelite.

A twist of the cap . . and it locks!

Twist-Lock **Devices eliminate time-losses and annoying delays because they "stay put" — are vibration-proof — assure a lockfast electrical connection under all conditions — are available polarized and grounded for safe operation!**

Twist-Lock **Devices are widely used by industries *wherever lockfast electrical connections are needed* to insure safe, uninterrupted production.**

1. Plug in-



2. Twist-

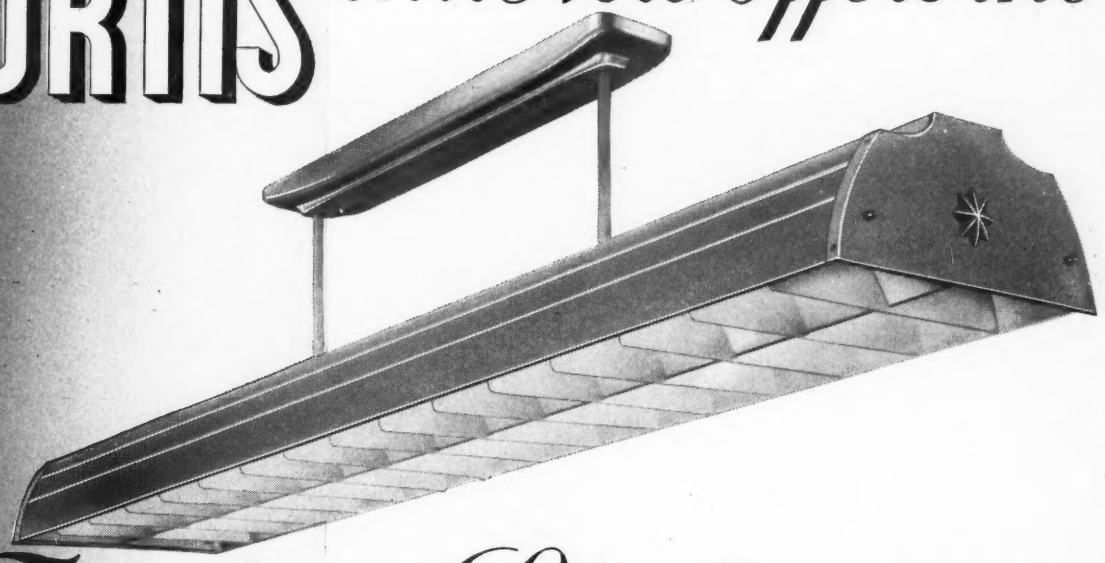
3. They're locked!

HUBBELL *Twist-Lock* DEVICES

HARVEY HUBBELL, INC. BRIDGEPORT, CONN.

via GraybaR MORE SUPPLIES COMING

CURTIS ..... *Now Offers the*



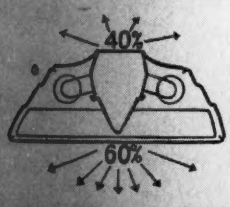
"Forty-Sixty ONE"

DESIGNED FOR TWO 100-WATT FLUORESCENT LAMPS

The enthusiastic acceptance of the original "Forty-Sixty" by both the trade and the consumer set the stage for Curtis "Forty-Sixty ONE."

This new unit differs from the "Forty-Sixty" only in size and lamp capacity. The "Forty-Sixty ONE" is ONE foot longer in order to accommodate two 100-watt lamps. The light output of the 100-watt lamp is approximately twice that of the 40-watt lamp.

Reflectors and louver fins are of Alzak Aluminum with Alzak reflecting surfaces and Satin Alzak finish. Louvers shield the lamps 25° lengthwise and crosswise. Arranged for use as individual units or continuous lines. Write for data sheets today.



BALANCED LIGHTING

Low brightness luminaire designed for eye comfort. Sectional view shows light distribution. 40% is directed toward ceiling where it is evenly diffused throughout the room . . . 60% is directed downward.

CURTIS *Lighting*
INC.
6135 WEST 65th STREET
CHICAGO 38 • ILLINOIS

FOR ELECTRICAL CONTRACTORS *via* GraybaR

Day-Brite's Easy Maintenance Begins on the Drawing Board

Here are a few of many reasons why maintenance of Day-Brite's heavy duty Day-Line industrial fluorescent fixture is a simple one-man job:

1. The porcelain enameled steel reflectors can be completely removed for servicing or cleaning. Just loosen the two hand-operated wing nuts. That's all. No tools are needed.
2. The wing nuts are fastened to reflector. They can't be lost when the reflector is removed.
3. In continuous installations, the reflectors can be individually removed. They are not fastened together.
4. The lamp starters are located behind sockets and can be replaced without disturbing the lamps.

***The* DAY-LINE**

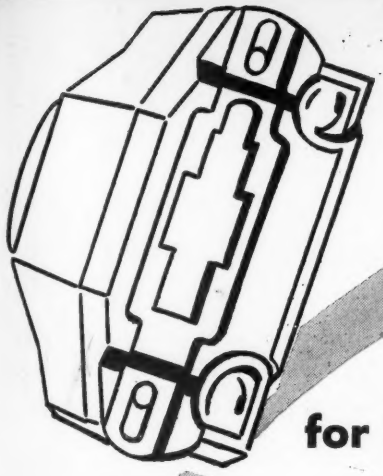
Heavy duty industrial fixture with porcelain-enameled steel reflectors. Designed for two and three 40-watt and two 100-watt lamps . . . unit and continuous installations. Patent Nos. 2317434, D135375, D133458. Write for Bulletin No. 30A.

Day-Brite Lighting, Inc., 5401 Bulwer Avenue, St. Louis 7, Mo.

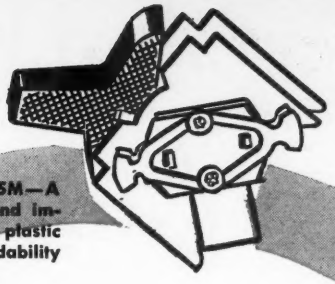
14

IT'S EASY TO SEE WHEN IT'S DAY-BRITE Lighting

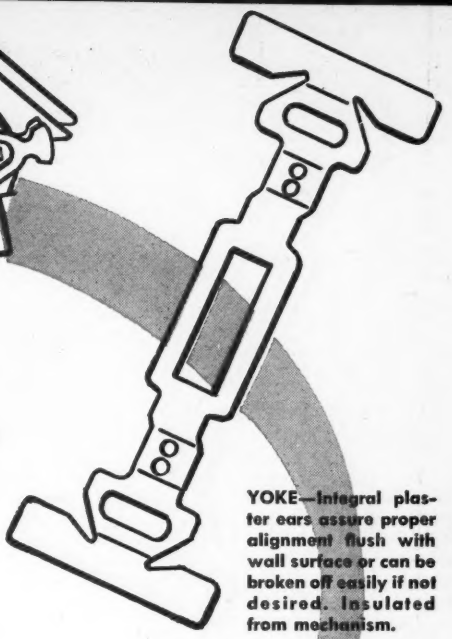
via GraybaR MORE SUPPLIES COMING



COMPLETE HOUSING—Tough, plastic housing with extra-thick walls completely encloses mechanism. Keeps out dust and dirt.



DURABLE MECHANISM—A rugged mechanism and impact resisting molded plastic handle assure dependability under severe usage.



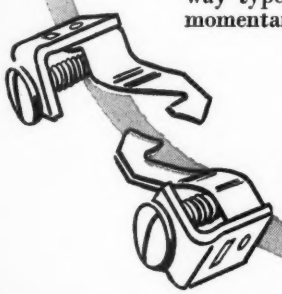
YOKE—Integral plaster ears assure proper alignment flush with wall surface or can be broken off easily if not desired. Insulated from mechanism.

for heavy-duty, shallow cup requirements

USE THE BRYANT 5861 LINE OF SWITCHES

Bryant 5861 switches are built for heavy duty service in commercial and industrial installations where higher-than-usual loads are encountered. Shallow cups (only 1½" deep) permit easy installation in conventional switch boxes. A rugged mechanism insures trouble-free service. "T" rated at 20 amps, 250 volts, they conform to Federal Specifications.

Available in single-pole, double-pole, three-way and four-way types with brown or ivory handles and lock-type or momentary contact mechanisms.



EASY WIRING—Top wired. Large, well-recessed binding screws make wiring easy.

THE BRYANT ELECTRIC COMPANY

SUPERIOR WIRING DEVICES

BRIDGEPORT 2, CONNECTICUT

NEW YORK SAN FRANCISCO CHICAGO LOS ANGELES

A SUBSIDIARY OF WESTINGHOUSE ELECTRIC CORPORATION

Specify Bryant Devices from your Electrical Wholesaler

FOR ELECTRICAL CONTRACTORS via GraybaR

Power line relocated . . . all material salvaged

You Can Do It With BullDog BUStribution DUCT

Manufacturers with an eye on tomorrow look to BullDog BUStribution DUCT for plug-in power supply, because this flexible bus duct system is *engineered for the future.*

"Moving day" in your plant can mean the time when your electrical system must be relocated, a new machine installed, or an old one shifted. In any case, BUStribution DUCT is ready for the change.

Built in standardized, prefabricated sections, it can be dismantled, moved and reassembled without scrapping a single nut or bolt. And when you shift a machine, the circuit protective plug moves right with it for easy mounting at the nearest plug-in opening. No cutting power . . . no tapping in "hot"—no lost production time.

Write for detailed descriptive folders. Or, better still, consult a BullDog field engineer who can show you a BullDog installation near your own plant.

SCREW DRIVER AND WRENCH *are all the tools you need to completely dismantle and reassemble a BullDog BUStribution System. Made up of prefabricated, standardized sections, the entire system can be used again and again in new combinations and at new locations. No fabrication on the job is necessary.*

NO WAITING FOR POWER *with a BUStribution System—simply raise the plug to the nearest plug-in opening, snap its contact fingers over the busbar conductors and bolt the plug to the duct casing. The plug itself is a current protective device for the machine it serves.*

NO SCRAP WITH ANY MOVE! *There is no waste when you move a BullDog BUStribution System from one location to another. The component materials—steel duct, copper bus bars and vitreous porcelain—do not readily deteriorate and can be used indefinitely.*

Capacities: Feeder type—600 amps. to 4,000 amps.; Plug-in type—225 amps. to 1,350 amps.

BullDog Also Manufactures Vacu-Break Safety Switches—SafToFuse Panelboards—Switchboards—Circuit Master Breakers—Industrial Trol-E-DUCT for Portable Tools, Cranes and Hoists—Universal Trol-E-DUCT for completely flexible lighting.

BULLDOG

ELECTRICAL DISTRIBUTION SYSTEMS

BULLDOG ELECTRIC PRODUCTS COMPANY, BOX 177, R. PK. ANNEX, DETROIT 32, MICHIGAN. In Canada: BullDog Electric Products, Ltd., Toronto. Field Engineering Offices in All Principal Cities

via GraybaR MORE SUPPLIES COMING

YOU Light Right when you Light with BENJAMIN

Fluorescent

plus

all this and more

Benjamin Fluorescent is the economical, efficient and most comfortable lighting for thousands of applications. However, there are thousands of other locations which require special lighting units or where incandescent or mercury-vapor lighting is more economical or desirable.

That is why Benjamin not only offers a wide line of fluorescent units but also has stressed through the years the importance of completeness...in incandescent units...for both indoor and outdoor service...for the special lighting requirements of hazardous, damp and dusty locations...for floodlighting...etc.

So complete is the Benjamin line that it is nearly always possible to select from available lighting units and fittings, equipment which will not only provide the Right Light but will simplify its installation and reduce maintenance costs to a minimum.

Benjamin Electric Mfg. Co. **DEPT. H.**
Des Plaines, Illinois.

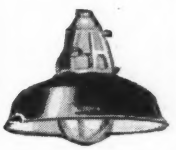
"Turnlox" **RLM DOME** Reflector

"Turnlox" **ELLIPTICAL ANGLE** Reflector

"Turnlox" **RLM BOWL** Reflector

PORCELAIN HIGH BAY Incandescent and Mercury

"PROJECTOLITE" Vapor-Tight



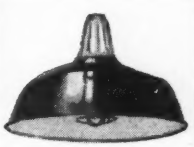
II-G DUST TIGHT UNIT with Dome Reflector

CEILING "VAPOLET" with Dome Reflector

EXPLOSION PROOF UNIT with Dome Reflector

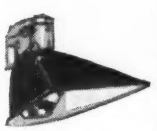
"STEELITE" Armor Clad Unit

"SILVERED LAMP" DIFFUSER



PORCELAIN DOME 400-Watt Mercury

ALZAK CONCENTRATING REFLECTOR Incandescent and Mercury

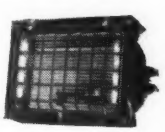


"DUO-SERVICE" Floodlight

"UTILITY" Floodlight

ALZO-LITE "Long-Range" Floodlight

COLUMN-LITE Outdoor unit



PIT & TUNNEL Lighting Units

STOCK-BIN-LITE Reflector

REFLECTOR LAMP GUARDS

WEATHER-PROOF FITTINGS & BRACKETS

Look to **BENJAMIN** TRADE MARK

for Lighting Equipment that precisely meets the need for *Right Light*

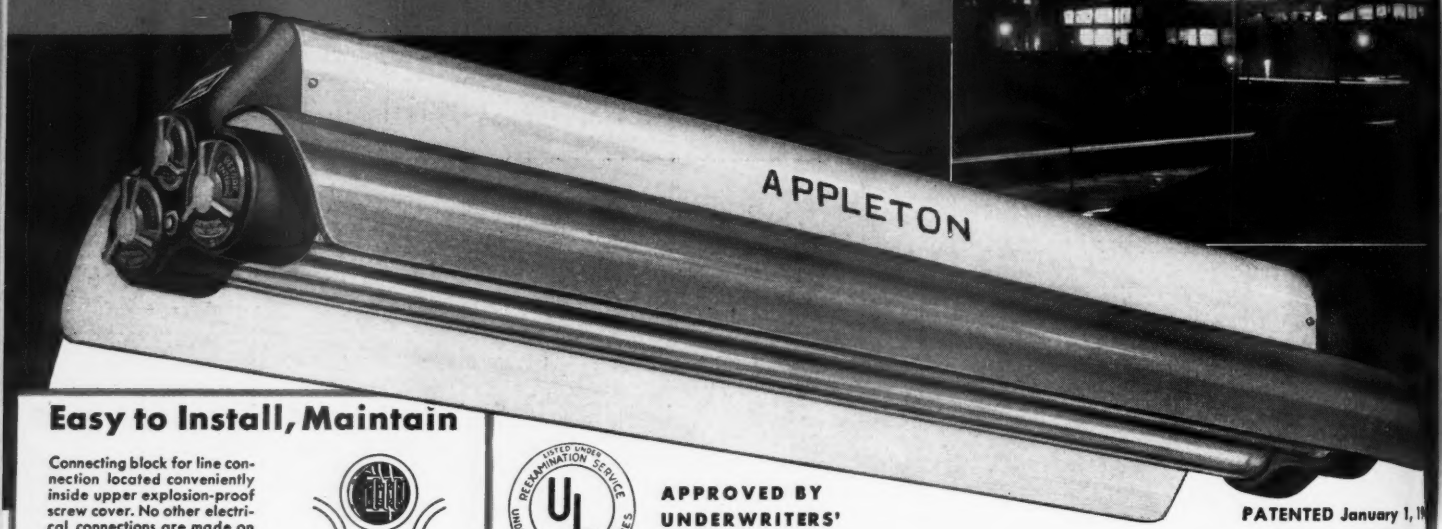
2033

FOR ELECTRICAL CONTRACTORS via GraybaR

FIRST

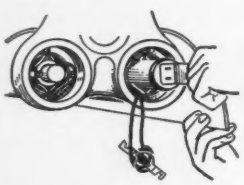
Explosion-Proof FLUORESCENT LIGHTING

FOR EVERY HAZARDOUS LOCATION!



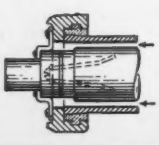
Easy to Install, Maintain

Connecting block for line connection located conveniently inside upper explosion-proof screw cover. No other electrical connections are made on the job.



Starters just inside lower explosion-proof screw covers can be replaced without removing lamps. Re-lamping is quick and easy with help of special tool or pliers.

Ballast mounted in explosion-proof housing at center of unit, under outer dust cover, is quickly accessible. Flexible coupling relieves any possible strain on Pyrex glass tubes.



Lamps are held in position in center of Pyrex tubes by springs which also facilitate re-lamping. Column of air around lamp, inside Pyrex tubes, maintains even temperature on surface of lamp, which prolongs life of lamp far beyond that of ordinary fluorescent equipment.

LISTED UNDER RE-EXAMINATION SERVICE — UL — UNDERWRITERS' LABORATORIES

APPROVED BY UNDERWRITERS' LABORATORIES

PATENTED January 1, 19
Patent No. 2,392,202

NEW LARGER SIZE ADDED

Still America's *first and only* Explosion-Proof Fluorescent Lighting Fixture, this great Appleton development now is available in an additional, larger size, accommodating two 60-inch, 100-watt, T-17 fluorescent lamps. The original fixture accommodates two 48-inch, 40-watt, T-12 lamps.

Appleton engineering skill enables you to bring all the advantages of modern fluorescent lighting to locations anywhere in your area listed in Class I, Groups C and D, and in Class II, Groups E, F and G. There's good business to be had by checking on those locations now.

SEND TODAY *for the big Appleton Catalog containing complete information on all of the 15,000 items in the* **complete** *Appleton line.*

Sold Through Electrical Wholesalers

APPLETON ELECTRIC COMPAN
1704 Wellington Ave. Chicago 13, Illino

Branch Offices: NEW YORK, 76 Ninth Ave. • DETROIT, 73 Woodward Ave. • CLEVELAND, 1836 Euclid Ave. • SAN FRAN CISCO, 655 Minna Street • ST. LOUIS, 420 Frisco Bldg. LOS ANGELES, 100 North Santa Fe Ave. • ATLANTA, 7 Boulevard, N. E. • BIRMINGHAM, 6 N. Twenty-first Street MINNEAPOLIS, 305 Fifth St., S. • PITTSBURGH, 414 Besse Bldg. • BALTIMORE, 100 E. Pleasant St. • BOSTON, 10 High • DENVER, 1530 Sixteenth St. • PHILADELPHIA, 1017 Cherry

Resident Representatives: Cincinnati, Dallas, Kansas City, Milwaukee, New Haven, New Orleans, Seattle

APPLETON ELECTRIC PRODUCTS

APPLETON

CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

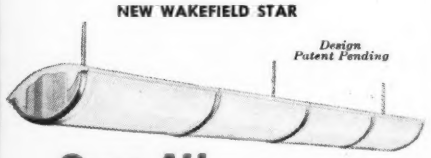
via GraybaR

MORE SUPPLIES COMING

For a "sky" of easy-eye light specify *The Wakefield STAR!*

It's brand new. Combines the advantages of fluorescent and indirect light. Pre-tested to give extra assurance of good lighting service. Plaskon reflector shield slides out like a drawer for easy cleaning. The ideal unit for Over-ALL LIGHTING in many school classrooms!

NEW WAKEFIELD STAR



Over-ALL . . .
in lighting
in sturdy construction
in ease of maintenance

Here's why Over-ALL Lighting *by Wakefield can help you do it!*

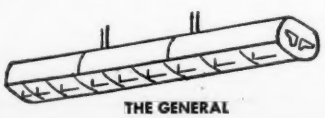
Wakefield's new Over-ALL lighting spreads soft, diffused light over all. As this picture suggests, its effect is as pleasing and comfortable for eyes as nature's sky. That's what makes it tops for school lighting . . . as well as for lighting offices and stores.

And Over-ALL lighting is tops for you because you can create it with any Wakefield lighting equipment . . . since Over-ALL lighting is based on "seeing" results. Incidentally, you'll find that the new Wakefield equipment has it *over* all others for sturdy construction, ease of installation (with completely interchangeable parts) and ease of servicing and maintenance. *And you get the extra selling help* of Wakefield's consistent advertising in the school field.

Ask your GRAYBAR house or local Wakefield representative to tell you about Over-ALL lighting. Or write for a copy of our new catalog No. 46. The F. W. Wakefield Brass Co., Vermilion, Ohio.

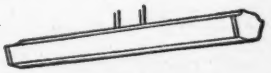
Wakefield

LIGHTING EQUIPMENT FOR OFFICE, SCHOOL AND DRAFTING ROOM


THE GENERAL

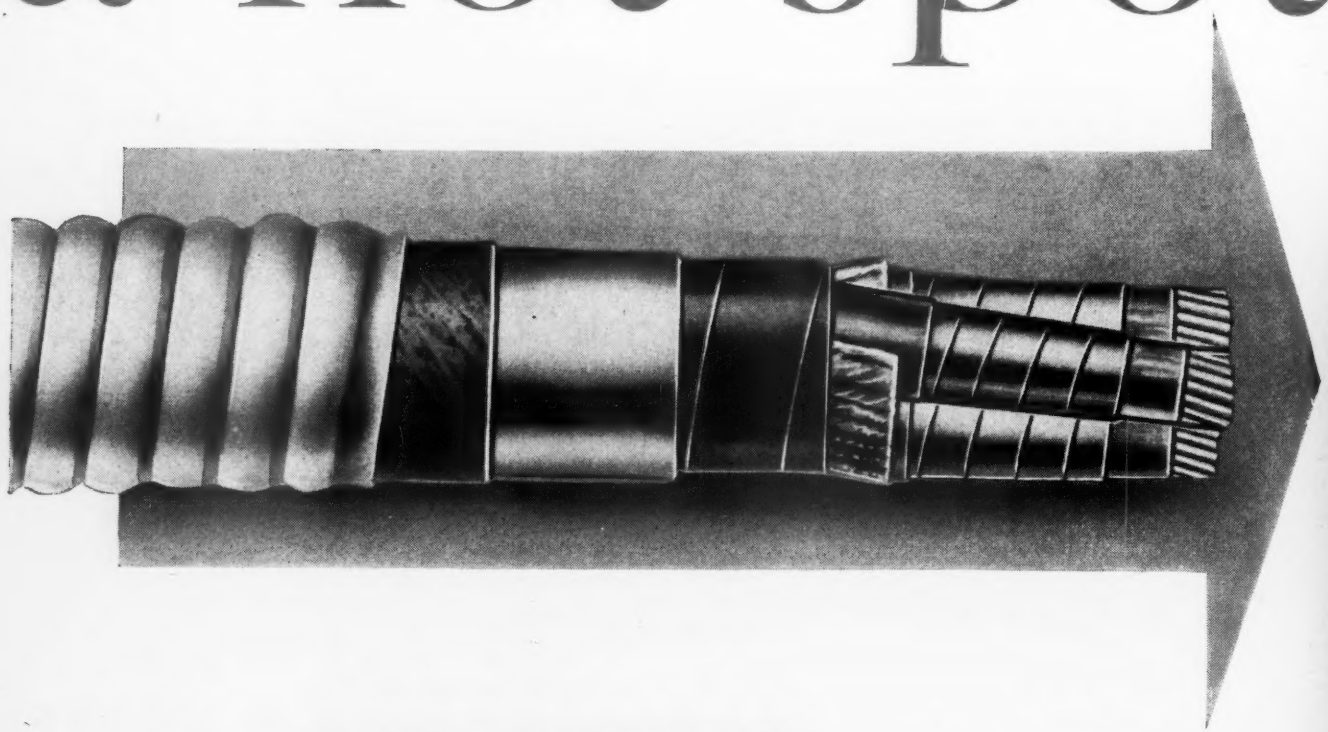
THE GRENADIER

THE COMMODORE


THE DIPLOMAT

FOR ELECTRICAL CONTRACTORS via GraybaR

headed for a hot spot



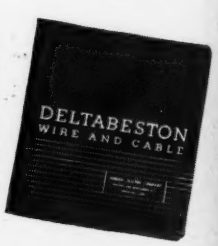
THERE'S A DELTABESTON* HEAT-RESISTANT CABLE TO MEET CONDITIONS IN YOUR PLANT

Here's a multiple-conductor cable that has solved its own housing problem. Specially designed to meet unusual conditions of temperature and humidity in a large industrial plant, its highly resistant lead sheath is encased in an interlocking steel armor which serves as a conduit for the cable. It was built to be tough and, at the same time, to maintain the safety factor so necessary for plant efficiency.

Deltabeston cables have proved their worth through years of practical service on heat-resistant jobs in G-E plants and products. And this *usage-experience* can prove valuable in helping to solve your own cable problems.

If you're looking for the extra assurance of dependability and service that Deltabeston can give—or if you need a special heat-resistant cable such as the one pictured here to do a particular job, your Deltabeston distributor is ready to help you meet these specifications and to provide advice that will forestall emergencies.

For a copy of the Deltabeston Cable catalog, write Section Y49-118, Appliance and Merchandise Department, General Electric Company, Bridgeport 2, Connecticut. Deltabeston Wires and Cables are distributed by General Electric Merchandise Distributors.



*Trade-mark Reg. U.S. Pat. Off.

GENERAL ELECTRIC

via GraybaR MORE SUPPLIES COMING

I Bought MITCHELL

because it's the lighting that looks like a million. It's done wonders for my business. I've got plenty of the comfortable, glare-free lighting I need. The utility man who recommended MITCHELL certainly helped me make a smart investment.

I Recommend MITCHELL

because there's a MITCHELL Fixture that's right for any layout I plan. Figuring a job with MITCHELL lighting is downright easy. As a utility man, I haven't got an axe to grind, but I *know* good lighting. That's why I recommend MITCHELL.

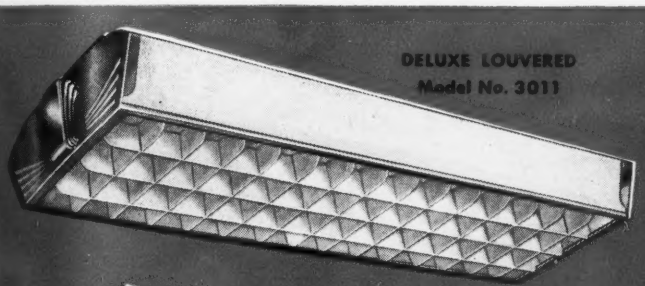
I Install MITCHELL

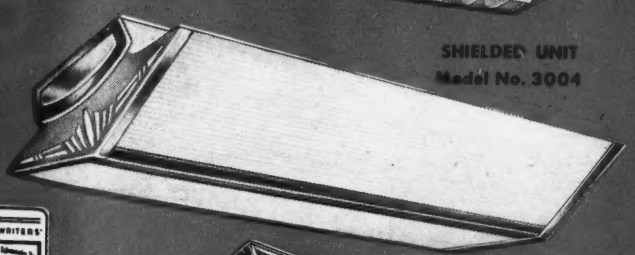
and it's a pleasure. Those fixtures are made right—to give top-notch service—*and* to hang with the least time and effort. Every MITCHELL job I do is a boost for me—brings me customers who want the same kind of efficient lighting.

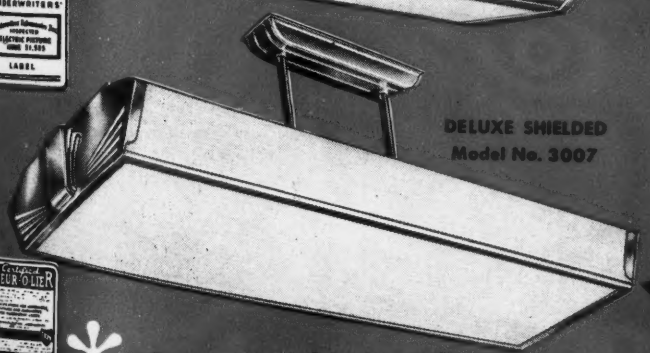
I Sell MITCHELL

and of course you know why after hearing what the others have to say. As a distributor, I find selling the line is mostly a matter of keeping up with the demand. My lighting department concentrates on MITCHELL, the line that sells itself!

There's a Meeting of Minds on ..... MITCHELL







USER, CONTRACTOR, UTILITY MAN, DISTRIBUTOR—each has his own reasons—good ones—for preferring MITCHELL Commercial Fluorescent Lighting. They add up to a "meeting of minds" on MITCHELL. The men who *sell* lighting, the men who *use* lighting are unanimous in their favorable opinion of this business-building, user-accepted line.

Mitchell Manufacturing Company
2525 CLYBOURN AVENUE, CHICAGO 14, ILLINOIS
Far West: *Complete Modern Plant and Sales Office at Los Angeles Serves the Entire Pacific Coast Area*
1019 NORTH MADISON AVENUE, LOS ANGELES 27, CALIFORNIA

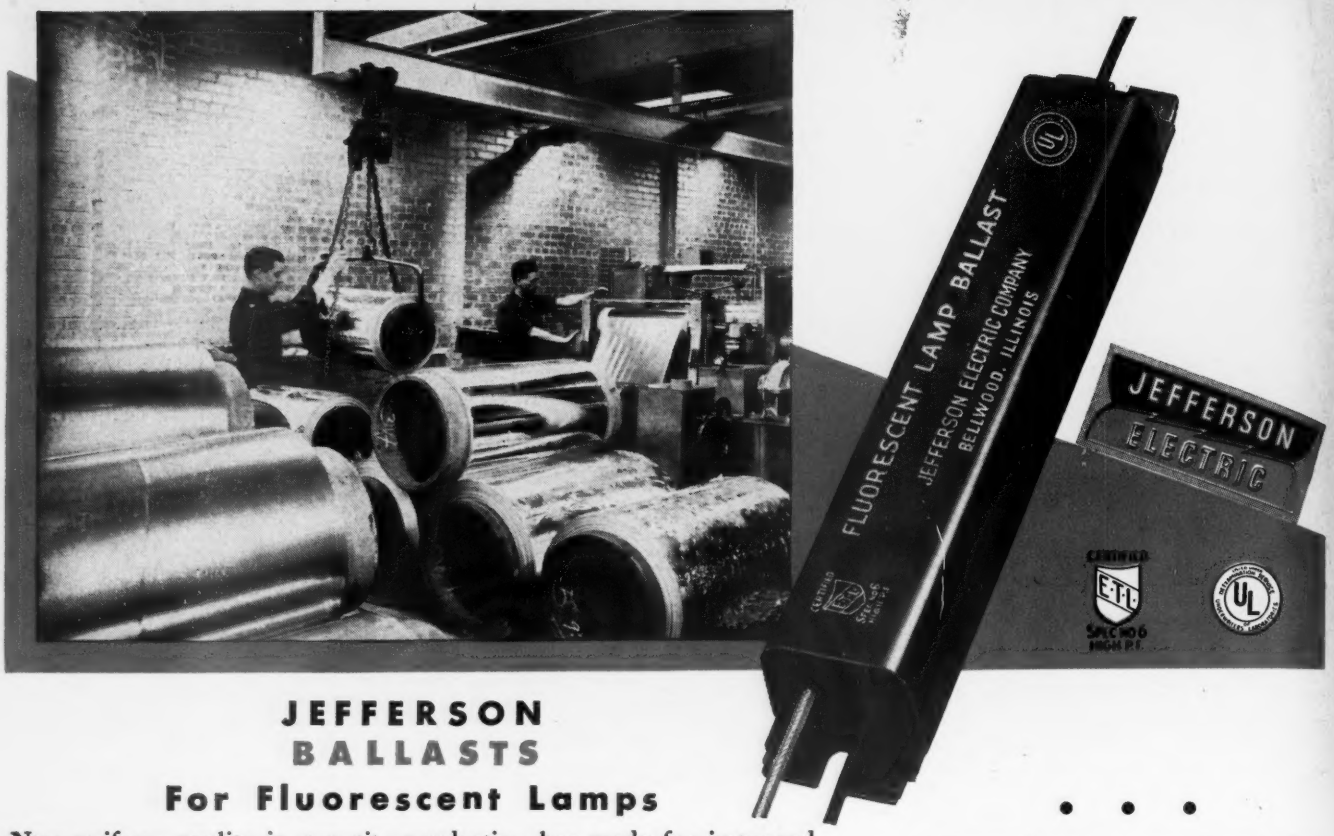
MITCHELL

*the preferred COMMERCIAL LUMINAIRES .....

Makers of Commercial and Industrial Fluorescent Lighting Equipment
Store Window Lighting • Spotlights and Floodlights • Desk Lamps • Portable Floor and Table Lamps • Bed Lamps • Ultraviolet and Infrared Health Lamps • Residential Lighting Specialties . . . Rad-i-Air Germicidal Units (made by Tru-Air Ultraviolet Products Co., Los Angeles.)

FOR ELECTRICAL CONTRACTORS via GraybaR

BETTER BALLASTS MEAN BETTER LIGHTING



JEFFERSON BALLASTS
For Fluorescent Lamps

New uniform quality in quantity production has made for improved fluorescent lamp performance. The Jefferson Electric line of Ballasts includes Ballasts for single, two-, three-, and four-lamp types. The popular 40-watt two-lamp Ballasts are designed to allow the leads to be brought out the bottom or ends—in the one case for convenience in mounting on narrow channels or in fixtures.

Appropriate Ballasts for Cold Cathode fluorescent lighting complete the line.

• • •

Jefferson Electric Line of Transformers include styles for control systems, enunciators, and signal systems, bell and chimes, radio, television, welders, electric fence controls.

Keeping electrical horsepower on the job—keeping manufacturing production up—and giving safe protection to electrical equipment without unnecessary shutdowns or damage are reasons for specifying and installing reliable fuses.

JEFFERSON UNION *Renewable* FUSES

Included in the features that make for longer serviceable life, a new method of securing the ends of the fibre bridge allows enough freedom of motion to insure holding the knife blades in alignment. This prevents unbalanced strains and buckling due to alternate heating and cooling, and changes in humidity. Assembly is facilitated and blades held in true alignment.

Specify Jefferson Union Renewable Fuses for longer lower cost protection.

JEFFERSON ELECTRIC COMPANY • Bellwood (Chicago Suburb), Illinois

IN CANADA: CANADIAN JEFFERSON ELECTRIC CO. LTD., 384 PAPE AVENUE, TORONTO, ONT.

via GraybaR

MORE SUPPLIES COMING

160 GIANT Revere 5 KILOWATT FLOODLIGHTS

the largest ever used to light a stadium primarily for football. Each flood produces a maximum beam candle power of approximately 2½ million. Units are louvered to produce a sharp cut-off with maximum eye comfort to spectators.

Graybar
World's Largest
ELECTRICAL SUPPLY HOUSE

A. B. Winters, Chief Engineer of Revere Electric Mfg. Co. and F. D. Wyatt, Electrical Engineer of Chicago Park Board examining one of the Revere 5000 Watt Floodlights at Soldier Field.

SELECT FLOODLIGHTS by *Revere*

To illuminate this giant stadium efficiently and without distorting the architecture with high towers was the immediate aim of all concerned. Revere engineers working with engineers of the Chicago Park Board jointly decided on mounting the floods on either side of the colonnades. The second problem to overcome was glare, so that all events would be afforded the utmost in visibility and eye comfort.

Revere 25-inch floodlights were tested and selected, equipped with an optical system of narrow beam reflector and horizontal spread lens together with a series of horizontal louvers to provide a highly concentrating confined beam of light. All units are cast aluminum—dust-tight and weather-proof.

Installed in time for lighting the Annual All Star Football game August 22nd, the floodlights exceeded expectations in providing brilliant visibility. If you have a problem requiring large area lighting, Revere Engineers will gladly put their shoulders to the wheel in solving it. Write for comprehensive catalog.

REVERE ELECTRIC MFG. CO.

6017 BROADWAY • CHICAGO 40, ILLINOIS

INDOOR AND OUTDOOR LIGHTING EQUIPMENT TO SERVE EVERY NEED

FOR ELECTRICAL CONTRACTORS *via* Graybar

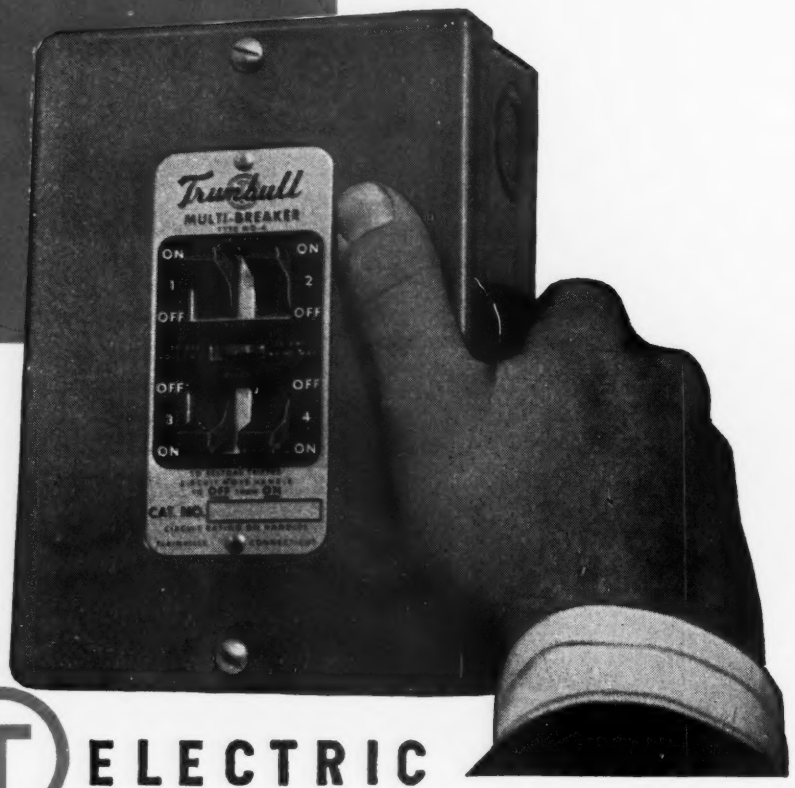
NEW

..TO THE ELECTRICAL INDUSTRY
..IN *Speed* OF TRIPPING
..IN COMPACT..STREAMLINE DESIGN

Magnetic *Plus* Thermal Branch Circuit Protection

Low Cost Circuit Breaker Operation

30 Ampere . . . for New Code Wire Ratings (Nov. 1-1946)



TRUMBULL (T) ELECTRIC

MO-4 MULTIBREAKER

Four Circuits----- or less

Countless thousands of locations require a sentry to guard 4 single phase circuits or less . . . for which duty Trumbull recommends the MO-4 Multibreaker . . . NEW to the Electrical Industry . . . an improvement of the MO-2, tested during war years in millions of circuits.

It is low in cost yet has both automatic overcurrent and short circuit protection for branch circuits, in the form of a Circuit Breaker with combined thermal and magnetic characteristics . . . for the greatest speed in tripping.

The MO-4 has a wide range of application in homes, garages, apartments, small stores, and is ideal for camp and farm installations. Specify or order this NEW TRUMBULL MO-4.

IN PRODUCTION NOV. 1 . . . ORDER NOW!

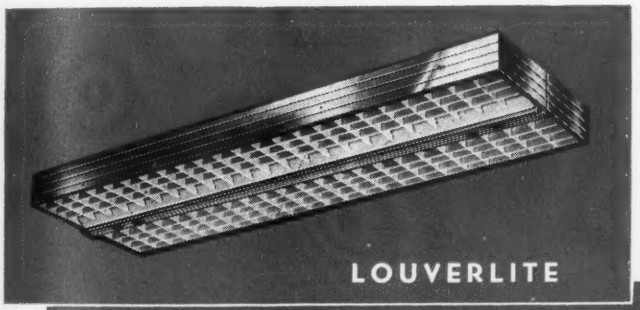
THE TRUMBULL ELECTRIC MANUFACTURING CO. • PLAINVILLE, CONN.

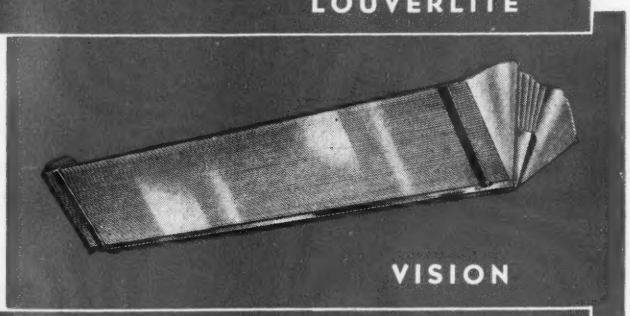
OTHER FACTORIES AT NORWOOD, OHIO • LOS ANGELES • SAN FRANCISCO • SEATTLE

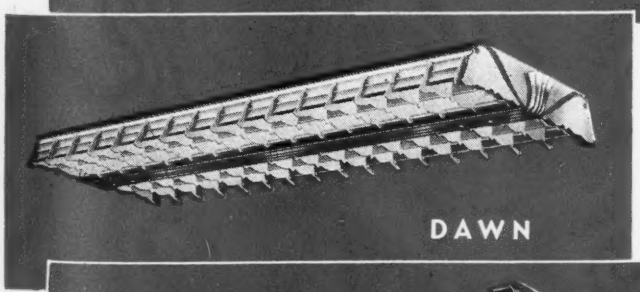
via GraybaR MORE SUPPLIES COMING

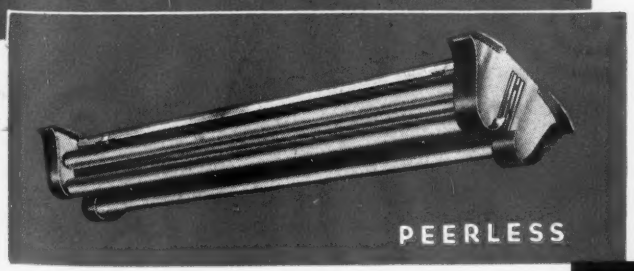
Top Performance-Dependability-Beauty

Smithcraft FLUORESCENT FIXTURES









PERFORMANCE

Only through years of planning, training and practice is it possible to assure perfect performance. Every Smithcraft fluorescent fixture has behind it countless hours of skilled effort brought to full perfection in the soft brilliance of the interior which it lights. Scientific planning on the designers' boards — exact curves of reflectors, dimensions and design of louvers—make every Smithcraft fixture produce the utmost in illumination.

DEPENDABILITY

Die-stamped housings, rigid and strong, mean lifetime efficiency. Completely wired and ready to hang, every Smithcraft unit is ever dependable in holding down maintenance costs. Easily operated hinged louvers greatly simplify cleaning and relamping. Installation costs are sharply cut by the exclusive Smithcraft one-man ceiling plate. For stem suspension mounting, the exclusive Smithcraft Non-Turn Stem Lock makes hanging a one-man job.

BEAUTY

The slender V type VISION, the DAWN with its decorative louvers, the practical grace of the LOUVERLITE—these and all of the Smithcraft line have real beauty designed into them. In open types there are the STANDARD and PEERLESS. The distinctive wood-frame HORIZON may be had with either etched glass panel or hinged louver. The SKYLITE, an attractive louvered unit with ribbed glass side panels, is smart for stores and offices.

A Complete Line of Industrial and Commercial Fluorescents

Distributed exclusively through electrical wholesalers

Smithcraft LIGHTING DIVISION

Chelsea 50, Mass.

FOR ELECTRICAL CONTRACTORS via GraybaR

PROTECTION WITH ECONOMY

Wise buyers have protected their circuits and installations with ECONOMY ever since 1911. Not only has ECONOMY pioneered in fuse invention and development, but has constantly improved the quality, performance and dependability of ECONOMY Fuses and "Drop Out" Renewal Links.

Available from stock in both ferrule and knife blade types.

OTHER TIME-TESTED ELECTRICAL FUSES
Arkless ... Clearsite ... Eco Midget ... Arkless Midget

SOLD THROUGH JOBBERS EXCLUSIVELY SINCE 1911: First to be approved by Underwriters Laboratories, Inc.

Protection WITH ECONOMY

Time-Tested • Reliable • Safe

REPRESENTATIVES IN ALL PRINCIPAL CITIES

1067

ECONOMY Fuse and Mfg Co.

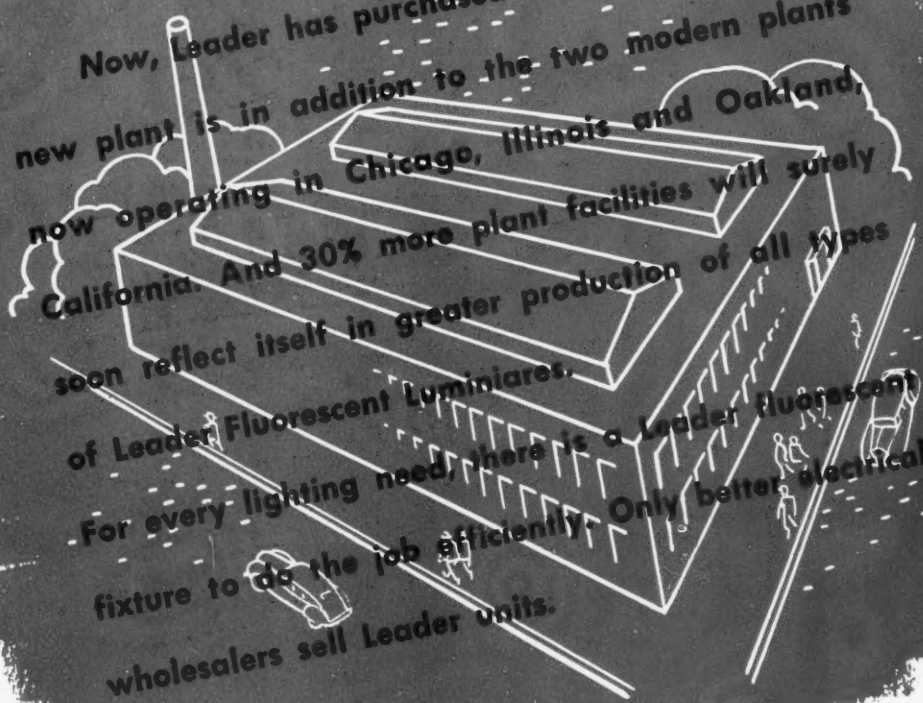
2717 N. Greenview Ave., Chicago 14, Illinois

via GraybaR

MORE SUPPLIES COMING

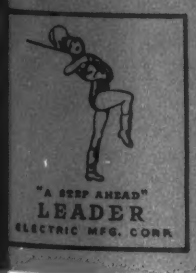
Leader announces

30% more plant facilities



Now, Leader has purchased another factory! This new plant is in addition to the two modern plants now operating in Chicago, Illinois and Oakland, California. And 30% more plant facilities will surely soon reflect itself in greater production of all types of Leader Fluorescent Luminiares.

For every lighting need, there is a Leader fluorescent fixture to do the job efficiently. Only better electrical wholesalers sell Leader units.



WEST COAST FACTORY
2040 LIVINGSTON ST, OAKLAND 6, CALIF.

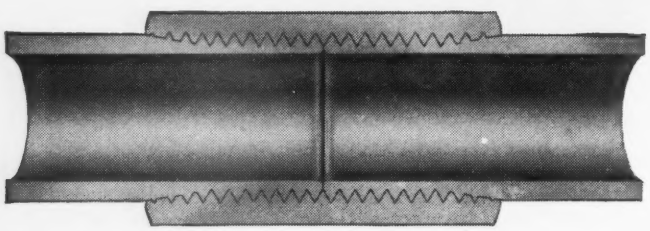
LEADER ELECTRIC MANUFACTURING CORP.
6127 N. Broadway, Chicago 40, Ill.

FOR ELECTRICAL CONTRACTORS via GraybaR

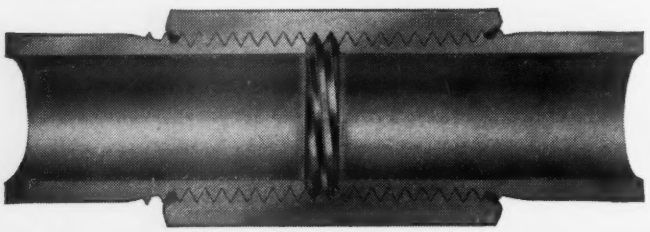
FULL WEIGHT—THREADED RIGID STEEL CONDUIT

SPECIFY
National Electric
SHERARDUCT

To Keep Wiring Safe, PERMANENTLY



SHERARDUCT COUPLING—All surfaces and threads are Sherardized. Accurately cut threads permit completely closed joints—no raw threads exposed—no gaps to interfere with ease of fishing.



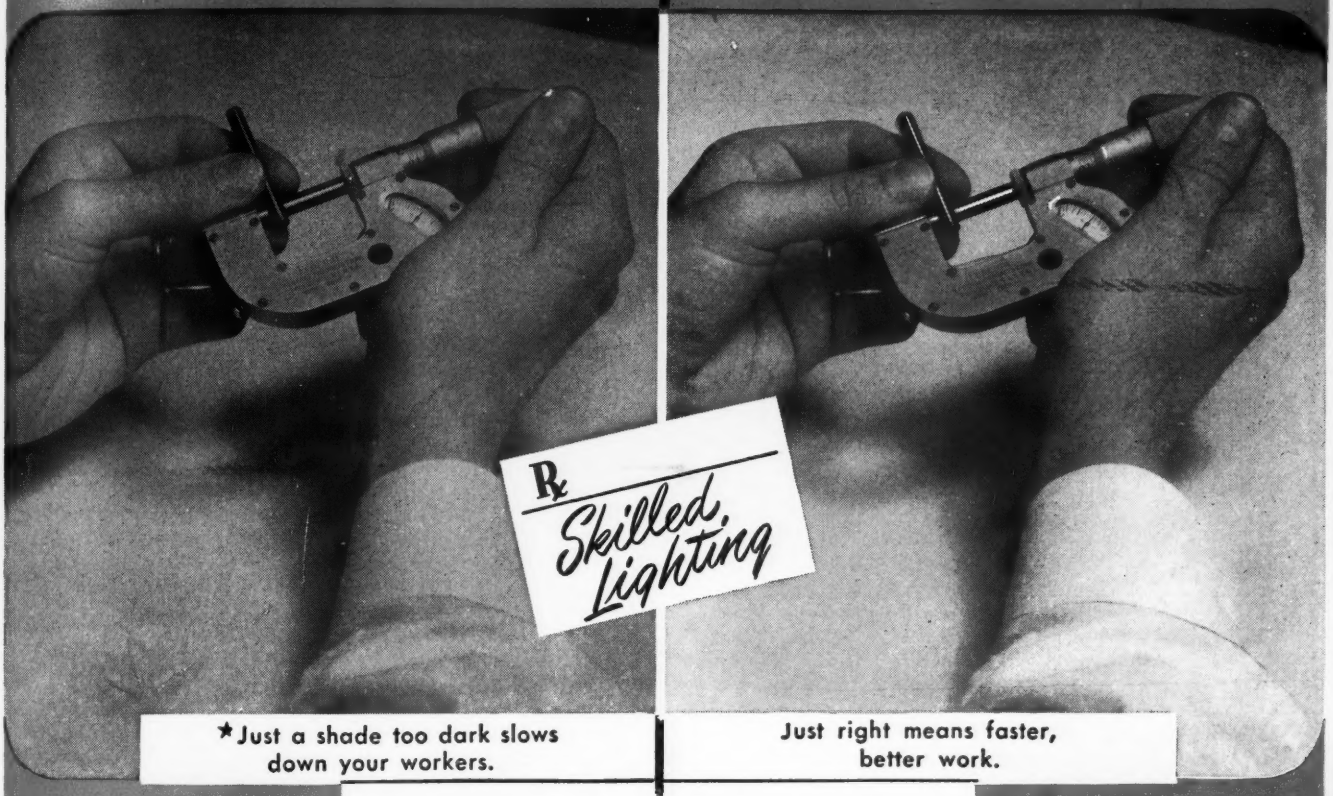
ORDINARY COUPLING—Raw threads meet raw threads—accelerates rust—weakens joint. Threads exposed in gaps trap wire ends—make fishing difficult.

When the job calls for a conduit that must withstand the test of time—there's only one Sherarduct! Sherarduct is a rigid steel conduit that is permanently rust-proof. The zinc protective coating alloyed to the steel by the special Sherardizing process will not crack or peel. Sherarduct is heavy-walled, threaded . . . bends easily . . . smooth inside to assure easy fishing.

National Electric
PRODUCTS CORPORATION
Pittsburgh, Pa.

via GraybaR MORE SUPPLIES COMING

Proved Prescription To Cure BORDERLINE VISION*

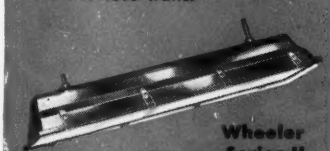


*Just a shade too dark slows down your workers.

Just right means faster, better work.

Wheeler Incandescent Fixtures

for general industrial use. RLM Solid Neck Standard Dome is only one of many types. Complete range of standard shapes . . . dome, angle, etc. Provide maximum lighting efficiency for lamps from 75 watts to 1500 watts.



Wheeler Series II Dust-Tight Units

for Class II "Group G & F" and Class III and IV Hazardous Locations. Hinged cover protects lamps from dust and vapors. Supplied with Double-Thick Plain Clear Glass, Water-White Plate Glass or Tempered Clear Safety Plate Glass.

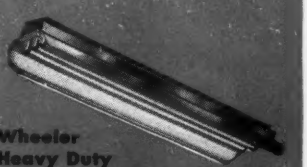
Install Wheeler Skilled Lighting, for more accurate work, faster.

You can't spot Borderline Vision at first glance, but watch an operation for a few minutes . . .

Every time a worker has to stop for a second look – somebody is losing money! Sometimes he fails to stop and the work is wrong – somebody is losing money! Are you sure *you* aren't that somebody, directly or indirectly? Wheeler Skilled Lighting can lick Borderline Vision, and put a stop to these losses.

Better work and reduced costs are almost automatic when you install Wheeler Skilled Lighting. Write today for full information on the complete line of Wheeler incandescent and fluorescent lighting fixtures. **Wheeler Reflector Company, 275 Congress Street, Boston 10, Mass.** Representatives in New York and principal cities.

Distributed Exclusively Through Electrical Wholesalers



Wheeler Heavy Duty Fluorescent Units

offer economical, high-intensity lighting for individual installation or continuous runs. Porcelain enameled steel reflectors with high reflection efficiency. Made for two 40-watt, three 40-watt and two 100-watt lamps.

Wheeler Vapolux Reflectors

for incandescent lighting in hazardous locations. Dust-tight and vapor-proof . . . highly durable and easy to install and service. Made in standard styles for lamps from 100 watts to 500 watts.

Wheeler REFLECTOR COMPANY

LIGHTING EQUIPMENT SPECIALISTS SINCE 1881

Industry's Electrical Systems Have Taken a *Terrific Beating*

IN THOUSANDS of plants, electrical distribution and control systems have been operating under abnormal stress during recent years. It's a certainty that many of them are overloaded or unreliable. They represent a definite profit leak which industry can ill-afford in these times of narrow profit margins.

Why not sell your industrial customers on the idea of a complete check-up on their electrical systems. In a surprising number of cases, it will save them plenty and develop additional business for you at the same time. Your nearest Square D Field Engineer will be glad to work with you.

Wherever Electricity Is Distributed and Controlled

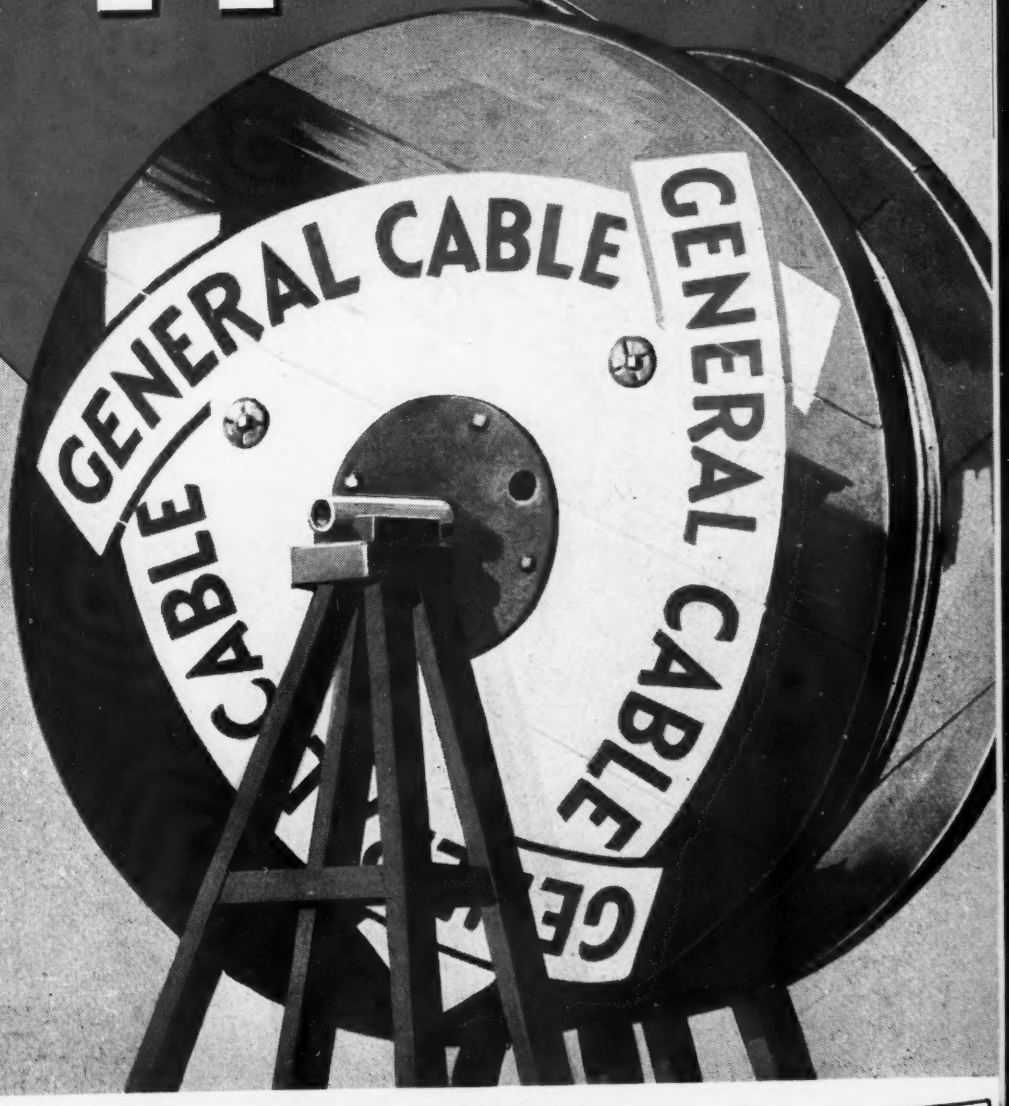
SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

via GraybaR MORE SUPPLIES COMING

General Cable Conductors as popular as their Suppliers

via GraybaR



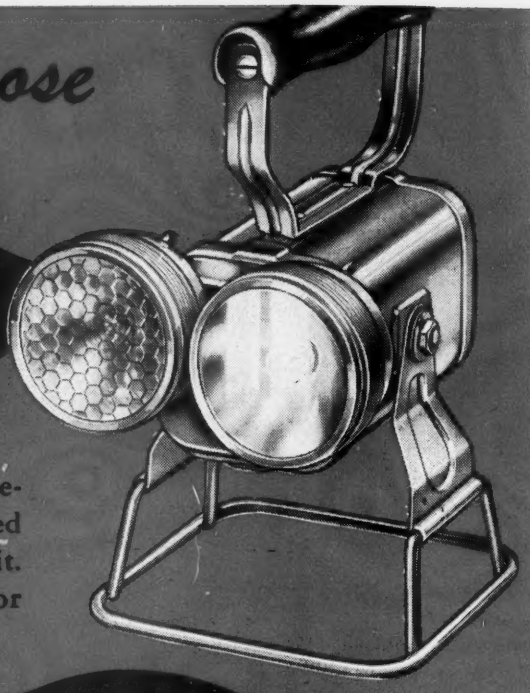
- GUARDIAN BUILDING WIRES and CABLES
- ROMEX non-metallic ARMORED CABLE
- VARNISHED CAMBRIC POWER CABLES
- PORTABLE POWER and SPECIAL SERVICE CABLES
- and OTHER WIRES AND CABLES FOR EVERY ELECTRICAL NEED

FOR ELECTRICAL CONTRACTORS

via GraybaR

Lights for every purpose

JUSTRITE
ELECTRIC LANTERNS and FLASHLIGHTS



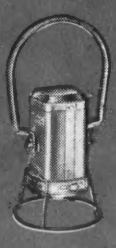
Designed and manufactured to meet your specific needs . . . to give you all the light you need . . . when you want it . . . where you want it. Scientifically designed . . . precision built . . . for years of efficient service.

Model No. 44-S

All-Purpose Safety Lantern No. 44-S (left). Twin bulbs. "Double-approved" for safety.

Model No. 40

Railroad Type Lantern useful for many purposes. Justrite Model No. 40 (right). Strongly constructed.



Model No. 42-W

Twin-Bulb Sportsman's Lantern No. 42-W (left). Uses standard 6-volt battery.

Model No. 2101

Justrite Utility Light No. 2101 (left). With Honeycomb Lens. Ideal trouble light.

Model No. 1904

4-cell Headlight Lantern Justrite Model No. 1904 (below) fastens around head with elastic band. Powerful spot beam.

Model No. 17-S

Handy service safety flashlight—Model No. 17-S (right, above). Stands upright, fits in palm or clips on belt. About 1800 candlepower beam from 3 cells. Double approved.

Model No. 17J31

New Justrite two-cell Penlight No. 17J31 (right). Red or white beam.

JUSTRITE
MANUFACTURING COMPANY

"Double Header" LANTERN — MODEL 2121

Here's a "must"... the new Justrite "Double Header" that gives you two different kinds of light with one lantern. Equipped with plain lens for brilliant spot beam for distant lighting—and a "Honeycomb" lens that gives a uniform light over a wide area. This new "Honeycomb" lens is a honey... throws a circle of light 3 ft. in diameter at 8 ft. distance. Both lights can be used simultaneously or alone. Each can be focused separately. Lantern body tilts on guard base so light can be directed at almost any angle. Regular 6-volt lantern battery insures low operating cost and long service.

MAINTENANCE LIGHT — MODEL 1955

This is tops in convenience. Can be fastened easily and quickly around head or on wrist, shoulder, or leg. Canvas straps hold battery case in comfortable position. Both hands are left free for working. Light can be focused directly on work. Equipped with plain spot beam lens. Can also be supplied with "Honeycomb" lens if desired. Uses 6-volt battery. Precision built of steel, plated to resist corrosion.

2063 N. Southport Ave., Dept. M-13, Chicago 14, Ill.

Approved Safety Lanterns
Approved Safety Flashlights
Electric Headlight Lanterns
Railroad Electric Lanterns

via GraybaR MORE SUPPLIES COMING F

COFFING HOIST CO.

EMERGENCY EXPERIENCE

to cut delays

In Line CONSTRUCTION and MAINTENANCE

Has resulted in more than 86 per cent of the Utilities Companies specifying

COFFING "Safety-Pull" HOISTS

AND OTHER

Pole Line Equipment

Ratchet Lever Hoists — **Safety Load Binders**

Temporary Cross Arms — **Temporary Guy Clamps**

Transformer Gins — **Power Pike Poles**

Flags and Flag Holders

Despite shortages of pole line equipment your GRAYBAR warehouse is in position to furnish you with COFFING products as quickly as it is humanly possible to do so.

COFFING HOIST COMPANY

800 Walter St. **Write for Bulletin E-4** **Danville, Ill.**

Mr. Cable-Buyer, you know that Neoprene jackets add long years of economical, trouble-free service to power cables, but, do you realize that all Neoprene jackets are not alike; that they vary both physically and chemically?

A recent issue of DuPont's Neoprene Notebook published this statement about Neoprene compounds.

"The properties obtained depend on how the product is compounded and upon the method used for its manufacture. The best Neoprene products are made by the best rubber manufacturers."

Since the first Neoprene-armored TIREX* Cords and Cables were produced, Simplex has been aware of this. Confidently, we offer our outstanding record in the development of rubber compounds, and our expertly-staffed research laboratories as your assurance that every TIREX Cord and Cable you buy is furnished with a Neoprene armor of unsurpassed quality.

In no other cable will you find greater resistance to the dangers of sunlight, oil, flame, and abrasives. From no other cable will you get more dependable day-in, day-out performance yet at less cost per hour of operation.

When you next buy, be sure to specify Simplex-TIREX, the only cords and cables with the famous Selenium-Neoprene Armor.

*Trade Mark Reg. U.S. Pat. Off.

Simplex

WIRES & CABLES

SIMPLEX WIRE & CABLE COMPANY
79 SIDNEY ST., CAMBRIDGE 39, MASS.

via GraybaR MORE SUPPLIES COMING

OFF ON

Another Mercoid Advantage

(Illustration shows a Mercoid Pressure Control)

In the event of trouble in an electric circuit, the first thing a service man checks is the switch. He wants to know whether the circuit is open or closed.

In the case of a Mercoid control in the circuit a quick glance at the position of the mercury switch tells the story. Such information however, is not so readily available in other types of switches where the contacts are concealed from the direct vision.

Every service man appreciates the various conveniences and advantages of Mercoid Controls.

It should be noted that the Mercoid mercury switch is also a means of better control performance and longer control life. All contact trouble is practically eliminated.

Complete Mercoid Catalog sent upon request.

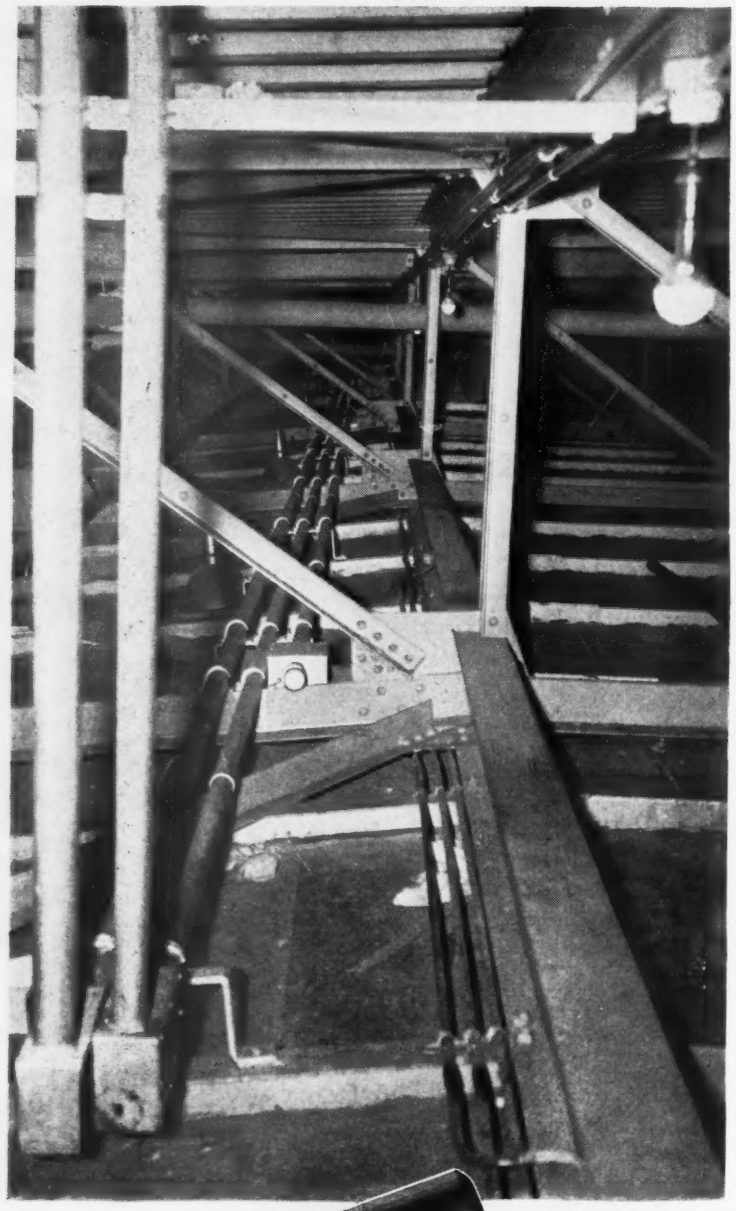
THE MERCOID CORPORATION, 4201 BELMONT AVE., CHICAGO 41, ILL.

★MERCOID CONTROLS

FOR HEATING, AIR CONDITIONING, REFRIGERATION, AND VARIOUS INDUSTRIAL APPLICATIONS

FOR ELECTRICAL CONTRACTORS via GraybaR

FOR SAFETY'S SAKE . . . USE CONDUIT *(Full Weight Rigid Steel)*



SURE PROTECTION

is cheaper than uncertain hazard

IT may be easy to take a chance --especially if wiring is in out of the way places, if it seems to be safe from careless people and tamperers.

But who can figure the cost of the risk--the risk of dust accumulation, moisture and vapors, vibration, intruding animals, birds, insects, possible explosion?

The only inexpensive fire or explosion is the one that is prevented from happening. It is cheaper in the end to be positively safe, to provide dependable protection for electric wiring--just as has been done in the attic space pictured here--for residence or public building, store or factory.

Youngstown "Buckeye" is a standard-threaded, full-weight rigid steel conduit--most widely used conduit in the world. Rigid steel conduit provides the only kind of wiring system that the National Electrical Code approves for hazardous locations and occupancies as being dust, moisture, vapor and explosion proof. Local distributors have "Buckeye" in stock now.

YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

GENERAL OFFICES - YOUNGSTOWN 1, OHIO

Export Offices - 500 Fifth Avenue, New York City

Manufacturers of

CARBON - ALLOY AND YOLOY STEELS

Ask your distributor for:

Youngstown Buckeye Conduit...Pipe and Tubular Products...Sheets...Plates...Electrolytic Tin Plate...Coke Tin Plate...Bars...Rods...Wire...Tie Plates and Spikes

via GraybaR

MORE SUPPLIES COMING

You can STOP the time consumed "running around"!

A Flip of a Key and You can Talk to Any Individual or Department in Your Business . . . Without Leaving Your Desk!

The problem of accomplishing more work is helped by keeping at it. That's why "Teletalk" intercommunication systems have proved such an aid to getting jobs done. You can install a system at reasonable cost to reach key men, key departments or any part of the plant. You STOP the unnecessary waste of time running from department to department, or individual to individual, or waiting for them to come to you. Each individual in the system can communicate with the other by just flipping a key and speaking into the "Teletalk". Stations can be provided with ear phones for complete privacy if desired.

The outstanding feature is the opportunity to better organize your work and get needed information—on the spot—without delay—with as much ease as though you had one or a dozen individuals working across the desk from you.

"Teletalk" intercommunication systems are inexpensive to operate, and you'll find that their convenience and time saved will pay for the cost within a reasonable length of time.

If you are loaded with work and trying to get more done, check the classified section of your telephone book for the listing of your "Teletalk" distributor and let him suggest the correct "Teletalk" installation to use. If you do not find him listed, write Webster Electric Company, Racine, Wisconsin, for full information.

Licensed under U. S. Patents of Western Electric Company, Incorporated, and American Telephone and Telegraph Company.

WEBSTER ELECTRIC

RACINE WISCONSIN

Established 1909

Export Dept. 13 E. 40th Street, New York (16), N. Y. Cable Address: "ARLAB" New York City

"Where Quality is a Responsibility and Fair Dealing an Obligation"

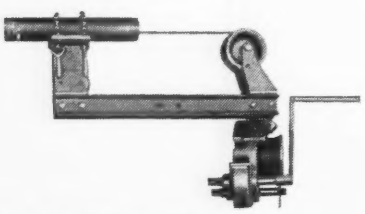
FOR ELECTRICAL CONTRACTORS via GraybaR

SAVE MANPOWER
SAVE MATERIALS

with efficient GREENLEE tools ✻

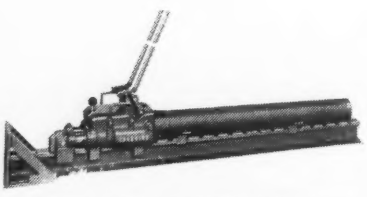
✻ HYDRAULIC BENDER FOR CONDUIT, TUBING, BUS-BARS

In but a few minutes with a GREENLEE *one man* can make accurate, smooth bends in rigid and *thin-wall* conduit, pipe up to 4½", tubing, bus-bars. And there is no kinking, wrinkling or other damage to conduit when using GREENLEE equipment! Easily pays for itself on the first few jobs through big savings of manpower and materials. Two models—No. 770 for conduit up to 3"; No. 775 for sizes up to 4½". Compact, portable for on-the-job bending. Small GREENLEE Hand Benders also available for bending steel, copper, brass, and aluminum tubing up to ¾" size.



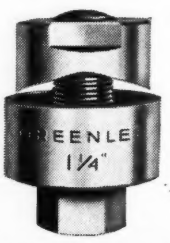
✻ CABLE PULLER

Easy-operating, compact unit for 7,500 pound pull. Fastens direct to conduit to allow pulling in line with conduit . . . no loosened hangers. Two speeds do the job quickly, easily. Attachment available for pulling from concealed conduit.



✻ HYDRAULIC PIPE PUSHER

Eliminates tearing up, back-filling, re-paving. It *pushes* pipe *under* streets, sidewalks, railroads, lawns and other obstacles. Two models: No. 790 for pipe ¾ to 4-inch; No. 795 for larger ducts and pipe.



✻ KNOCKOUT TOOLS

Eliminate drilling and filing to enlarge holes. In 1½ minutes or less cut openings up to 3½-inch. Just insert in knockout or small hole and turn with wrench. Cut clean holes in bakelite, hard rubber, or metal up to ⅛" thick.

OTHER TIMESAVING GREENLEE TOOLS FOR THE ELECTRICIAN

JOIST BORERS • RADIO CHASSIS PUNCHES • AUGER BITS • EXPANSIVE BITS • BIT EXTENSIONS • BELL HANGERS' DRILLS. ASK YOUR ELECTRICAL DISTRIBUTOR FOR INFORMATION ON THE COMPLETE LINE OF GREENLEE ELECTRICIAN'S TOOLS OR WRITE GREENLEE TOOL CO., 1751 COLUMBIA AVENUE, ROCKFORD, ILLINOIS.

REGISTERED TOOLS
GREENLEE
FOR THE CRAFTSMAN

via GraybaR

MORE SUPPLIES COMING

YES, THAT'S THE TICKET

TO SPEED UP YOUR WINDING OPERATIONS, make each coil and motor last longer, reduce costly shutdowns.

With Roebling Magnet Wire you get uniformly "dead soft" conductors of high conductivity copper, fully annealed. It's that softness which makes it easy to handle from one coil end to another, cuts time wasted in forming and working, minimizes the stretch and strain that leads to wire failure.

And whatever your insulation specifications – for flexibility, toughness, dielectric strength, heat-aging, stretch, abrasion-resistance—Roebling makes them. Pick what you need from the wide range of Roebling magnet wire insulations; single, double or triple cotton; asbestos tape and cotton; enamel; paper; enamel and cotton; Roeglas (Fiberglas); and Roevar (polyvinyl acetal synthetic).

Quality throughout is assured because Roebling, with its unexcelled modern facilities, performs every manufacturing operation from hot-rolling copper bars to testing the finished wire product.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities

- ✓ Single Cotton
- ✓ Double Cotton
- ✓ Triple Cotton
- ✓ Asbestos Tape and Cotton
- ✓ Enamel
- ✓ Enamel and Cotton
- ✓ Paper
- ✓ Roeglas (Fiberglas)
- ✓ Roevar (polyvinyl acetal synthetic)

JAR ROEBLING

ELECTRICAL WIRES AND CABLES

WEATHERPROOF WIRE • SERVICE ENTRANCE CABLES • RUBBER AND PLASTIC COVERED WIRES AND CABLES (INCLUDING SMALL DIAMETER INSULATED BUILDING WIRES) • RUBBER SHEATHED PORTABLE CABLES • RUBBER INSULATED POWER CABLES • MAGNET WIRE • TELEPHONE WIRES • PIGTAIL AND BRAIDED COPPER • BARE COPPER STRAND • TROLLEY WIRE • VARNISHED CAMBRIC POWER CABLES

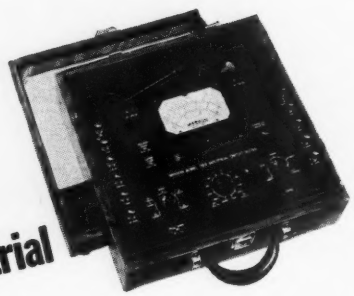
ROEBLING

FOR ELECTRICAL CONTRACTORS via GraybaR

to Streamline ELECTRICAL TEST PROCEDURE

★ **the simplified AC CLAMP AMMETER**
(Model 633)

◆ provides the simplest, quickest means for determining circuit conditions, loads taken by motors and other electrical equipment — all during normal operation without circuit interruption. The clamping jaws are simply placed over the conductor or bus, and current reading taken.



★ **the complete industrial CIRCUIT TESTER**
(Model 785)

◆ 27 meters in one — with selected AC and DC voltage, current, and resistance ranges. With DC voltage sensitivity of 20,000 ohms per volt, it is ideal for testing photo-cell and sensitive relay circuits, alarm systems, electronic equipment etc., as well as small motors and controls, lighting circuits, etc. Can be used with current transformers and voltage multipliers.

★ **the versatile SIGHT METER**
(Model 703)

◆ direct-reading, pocket size meter calibrated to measure light values in foot-candles, and in "seeing tasks". Equipped with the WESTON VISCOR filter, it measures all light values direct, without correction factors. Models for other requirements.

For complete information on these, and other time-saving WESTON instruments write . . . Weston Electrical Instrument Corporation, 578 Frelinghuysen Avenue, Newark 5, New Jersey.

Weston *Instruments*

Albany · Atlanta · Boston · Buffalo · Chicago · Cincinnati · Cleveland · Dallas · Denver · Detroit · Jacksonville · Knoxville · Los Angeles · Meriden · Minneapolis · Newark · New Orleans · New York · Philadelphia · Phoenix · Pittsburgh · Rochester · San Francisco · Seattle · St. Louis · Syracuse • In Canada, Northern Electric Co., Ltd., Powerlite Devices, Ltd.

via GraybaR MORE SUPPLIES COMING

ORDER NOW

FROM OUR NEAREST DISTRIBUTING HOUSE

The products shown on the preceding pages —as well as thousands of other electrical supplies and tools—are most readily available to you via Graybar. For additional information—and for the fastest possible delivery of the electrical items you need to meet your customers' requirements—call, wire, or write the nearest Graybar distributing house listed below.

ALABAMA
Birmingham 3 — 1529-31 First Ave., N. (*Birmingham* 4-1861)

ARIZONA
Phoenix 2 — 434 West Madison St. (*Phoenix* 3-6131)

ARKANSAS
*Little Rock — 509 Exchange Bldg.

CALIFORNIA
Los Angeles 12 — 201 Santa Fe Ave. (*Trinity* 3321)
Oakland 4 — 222-24—9th St. (*Glencourt* 5451)
Sacramento 1 — 1900—14th St. (*Sacramento* 2-1828)
San Diego 1 — 720 State St. (*Franklin* 1361)
San Francisco 1 — Ninth & Howard Sts. (*Market* 5131)

COLORADO
Denver 2 — 18th & Blake Sts. (*Tabor* 7116)

CONNECTICUT
Hartford 6 — 344 Capitol Ave. (*Hartford* 2-8266)
New Haven 7 — 25 Union St. (*New Haven* 8-4163)

DELAWARE
Wilmington 3 — 1005 West Fourth St. (*Wilmington* 4-6245)

DISTRICT OF COLUMBIA
Washington 2 — 1355 New York Ave. N.E. (*Trinidad* 8080)

FLORIDA
Jacksonville 1 — 12th & Main Sts. (*Jacksonville* 5-6785)
Miami 30 — 835 Northwest First Ave. (*Miami* 2-3168)
Orlando — 533-35 W. Central Ave. (*Orlando* 6133)
Tampa 1 — 416 Ellamae St. (*Tampa* 2601)

GEORGIA
Atlanta 1 — 167 Walton St. N.W. (*Jackson* 2261)
Savannah — 570 Indian St. A*Savannah* 2-1121)

IDAHO
Boise — 2227 Fairview Ave. (*Boise* 6315)

ILLINOIS
Chicago 7 — 500 So. Clinton St. (*Webster* 2800)
Peoria 2 — 212 E. State St. (*Peoria* 4-8211)

INDIANA
Hammond — 5830 Calumet Ave. (*Hammond* 5830)
Indianapolis 7 — 400 W. Ohio St. (*Riley* 7525)
Evansville 14 — 1709 Columbia St. (3-5484)

IOWA
Davenport — 206-210 East 5th St. (*Davenport* 3-2769)
Des Moines 9 — 112 Eleventh Street (*Des Moines* 3-8614)

KANSAS
Wichita 1 — 424 No. Rock Island Ave. (*Wichita* 3-4294)

KENTUCKY
Louisville 2 — 624-628 So. Sixth St. (*Jackson* 1174)

LOUISIANA
New Orleans 10 — 601 So. Peters St. (*Canal* 1667)

MAINE
Portland 3 — Center & Commercial Sts. (*Portland* 3-1761)

MARYLAND
Baltimore 2 — 100 South St. (*Saratoga* 5050)

MASSACHUSETTS
Boston 16 — 287 Columbus Ave. (*Kenmore* 4567)
Springfield 5 — 453 Worthington St. (*Springfield* 7-4373)
Worcester 8 — 165 Commercial Street (*Worcester* 6-4311)

MICHIGAN
Detroit 1 — 55 West Canfield Ave. (*Columbia* 5500)
Flint 1 — 118-122 E. Third St. (*Flint* 2-4101)
Grand Rapids 2 — 432 Monroe Ave. N. W. (*Grand Rapids* 8-1231)
Lansing 2 — 125 E. Shiawassee St. (*Lansing* 4-5434)

MINNESOTA
Duluth 2 — 320 West 1st St. (*Melrose* 6646)
Minneapolis 15 — 824 So. Fourth St. (*Geneva* 1621)
St. Paul 1 — 145 East 5th St. (*Cedar* 7491)

MISSISSIPPI
Jackson — 758 Ricks St. (3-6316)

MISSOURI
Kansas City 8 — 1644 Baltimore Ave. (*Grand* 0324)
St. Louis 3 —2642 Washington Ave. (*Newstead* 4700)

NEBRASKA
Omaha 2 — 1120 Capitol Ave. (*Atlantic* 5740)

NEW HAMPSHIRE
Manchester — 103 Hampshire Lane

NEW JERSEY
Newark 5 — 2 Liberty St. (*Market* 2-5100)

NEW YORK
Albany 4 — 40 VanWoert St. (*Albany* 5-1564)
Buffalo 3 — 77-79 Swan St. (*Washington* 3700)
New York 14 — 180 Varick St. (*Walker* 5-8000)
Rochester 4 — 186 North Water St. (*Stone* 5400)
Syracuse 1 — 327 No. West St. (*Syracuse* 2-1281)

NORTH CAROLINA
Asheville — 221 Patton Ave. (*Asheville* 6002)
Charlotte 1 — 120 W. Morehead St. (*Charlotte* 7177)
Durham — 303 South Duke St. (*Durham* F-113)
Winston-Salem 1 — 321-327 Brookstown Ave. (*Winston-Salem* 5173)

OHIO
Akron 9 — 255 James St. (*Franklin* 2121)
Cincinnati 2 — 310 Elm St. (*Main* 0600)
Cleveland 14 — 1010 Rockwell Ave. (*Cherry* 1360)
Columbus 15 — Third & Chestnut Sts. (*Main* 5408)
Dayton 2 — 332 West Monument Ave. (*Hemlock* 1268)
Toledo 2 — 1700 Canton St. (*Main* 8131)
Youngstown 1 — 211 N. Champion St. (*Youngstown* 4-4578)

OKLAHOMA
Oklahoma City 2 — 706 West Main St. (*Oklahoma City* 3-9351)
*Tulsa 3 — 315 Beacon Bldg. (*Tulsa* 2-2181)

OREGON
Portland 9 — Park & Flanders Sts. (*Broadway* 1445)

PENNSYLVANIA
Allentown — 1941 Hamilton St. (*Allentown* 3-3181)
(*Bethlehem* 10657)
Harrisburg — 400 So. Second St. (*Harrisburg* 7303)
Philadelphia 7 — 910 Cherry St. (*Walnut* 5405)
Pittsburgh 22 — 37 Water St. (*Court* 4000)
Reading — 22 So. Third St. (*Reading* 6231)

RHODE ISLAND
Providence 3 — 194-196 Richmond St. (*Dexter* 8100)

SOUTH CAROLINA
Columbia — 1927 Main St. (*Columbia* 2-2125)

TENNESSEE
Chattanooga 1 — 1222 Carter St. (*Chattanooga* 6-5624)
Knoxville 30 — Henley St. & Union Ave. (*Knoxville* 3-6171)
Memphis 1 — 484 S. Front St. (*Memphis* 8-1207)
Nashville 2 — 313-315 —8th Ave. So. (*Nashville* 6-7161)

TEXAS
Amarillo — 704 E. 3rd Ave. (2-6778)
Beaumont — 201 Cypress St. (*Beaumont* 6921)
Corpus Christi — 1310 Agnes St. (*Corpus Christi* 8012)
Dallas 2 — 400 So. Austin St. (*Central* 6454)
Fort Worth 2 — 1605 Commerce St. (*Ft. Worth* 2-3178)
Houston 1 — 2001 Commerce St. (*Charter* 43561)
San Antonio 8 — 1401 No. Hackberry St. (*Fannin* 6274)

UTAH
Salt Lake City 13 — 245 So. First West St. (*Salt Lake City* 3-3894)

VIRGINIA
Norfolk 1 — 333 West 21st St. (*Norfolk* 2-2727)
Richmond 19 — 6th & Cary Sts. (*Richmond* 2-2833)
Roanoke 5 — Salem Ave. & Sixth St. (*Roanoke* 8105)

WASHINGTON
Seattle 4 — King & Occidental Sts. (*Main* 4635)
Spokane 8 — 152 South Post St. (*Riverside* 3151)
Tacoma 1 — 2112 A St. (*Main* 0166)

WISCONSIN
Milwaukee 2 — 778 N. Milwaukee St. (*Marquette* 1946)

*Sales Offices

Via GraybaR — serving the Nation's Electrical Contractors

ADEQUATE WIRING SERVES AND SAVES — THE KEY TO THE HOME OF TOMORROW

FOR ELECTRICAL CONTRACTORS — via GraybaR

Leading manufacturers like these

Appleton Electric Company
Benjamin Electric Manufacturing Company
The Bryant Electric Company
Bulldog Electric Products Company
Bussmann Manufacturing Company
Coffing Hoist Company
Curtis Lighting, Incorporated
Day-Brite Lighting, Incorporated
Economy Fuse and Manufacturing Company
General Cable Corporation
General Electric Company
(Appliance and Merchandise Department)
Greenlee Tool Company
Harvey Hubbell, Incorporated
Ilg Electric Ventilating Company
Jefferson Electric Company
Justrite Manufacturing Company
Leader Electric Manufacturing Company
The Mercoid Corporation
Mitchell Manufacturing Company
National Electric Products Corporation
Republic Steel Corporation
(Steel and Tubes Division)
Revere Electric Manufacturing Company
John A. Roebling's Sons Company
A. L. Smith Iron Company
Simplex Wire and Cable Company
Square D Company
The Thomas and Betts Company
The Trumbull Electric Manufacturing Company
The F. W. Wakefield Brass Company
Weston Electrical Instrument Corporation
Wheeler Reflector Company
The Youngstown Sheet and Tube Company

are pushing production to bring you

MORE SUPPLIES

IN OVER 90 PRINCIPAL CITIES

THESE ANNOUNCEMENTS of new equipment are necessarily brief—for more detailed description, sizes, prices and other data write to the manufacturers' advertising department, tell them in what issue of ELECTRICAL CONTRACTING you saw the item and they will send full details to you.

Equipment News

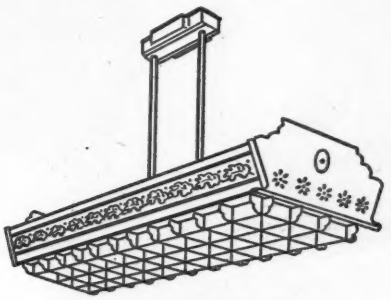
Electric Fence Controller

New developments have been made in the high-line controller model No. 486. The multiple signal light system used in this model is a fully automatic signalling means. It consists of a series of neon bulbs balanced in the fence circuit to show the exact condition of the entire fence system. Any current leakage on the fence is reflected in the system by causing one or more of the lights to cease flashing. The shock control switch enables the farmer to select the proper combination of voltage and current for wet, normal and dry operating conditions. Prime Manufacturing Company, 1669 South First Street, Milwaukee, Wis.

PRIME CONTROLLER

Fluorescent Fixture

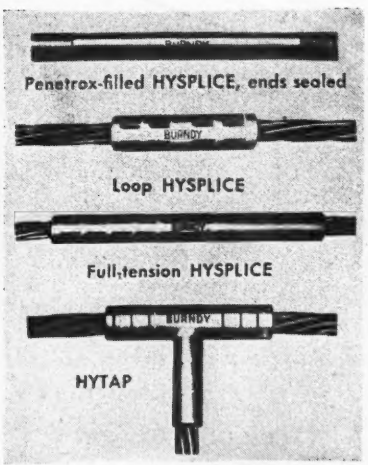
A new fluorescent lighting fixture, the Light Director, is in production and may be obtained in two widths, 12 and 17 inches. The number of 40-watt lamps mounted in each unit varies from two to five and the fixtures are planned to operate on a-c current at 110-120 volts. End plates, finished in baked white enamel, hold side glass diffusing panels and a bottom diamond-shaped louvre assembly which directs the illumination downward and eliminates angular source brightness. This louvre bottom may be removed should a glass panel be desired to match the end plates. Fixtures can be mounted either as single units or in continuous runs by removing the end plates and they may be either suspended from chrome stems or mounted flush with the ceiling. The overall length of the luminaire is 49 inches. L. J. Segil Co., 2500 West North Ave., Chicago 47, Ill.



SEGIL LIGHT DIRECTOR

Overhead Connector

Penetrox, a compound which penetrates oxide on conductor surfaces, and seals them against air and moisture, is featured in the line of Hysplice connectors for overhead high tension lines. These connectors are installed with standard Hypresses and are available in types for jumper loops and full tension service. Each connector is supplied filled with the Penetrox compound and sealed at each end. Hysplices and Hytaps are available for use with either aluminum or copper cables; the copper connectors being filled with Penetrox-C and the aluminum connectors with Penetrox-A. Burndy Engineering Company, Inc., 111 Bruckner Blvd., New York 54, N. Y.



BURNDY CONNECTOR

Cutouts

Announcement has been made of an improved line of heavy duty oil fuse cutouts for over-current protection of power distribution systems in the 2400, 4160, 4800 and 7200 volt classes. The cutouts utilize the new universal fuselinks which provide higher interrupting ratings, clearing fault currents as high as 11,000 amperes, depending upon the rating. There are no exposed live parts and no arc flames are ejected during current interruption. General Electric Co., Schenectady, N. Y.

G-E CUTOUTS

YOU'RE ON THE RIGHT TRACK...

WITH U.S. SECURITY

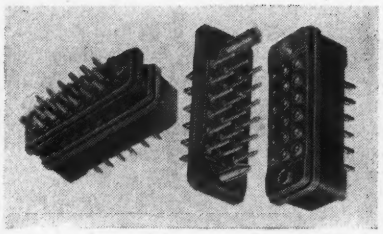
● **Why? Because Security does the job better. It's highly dielectric, non-ravelling, straight-tearing, highly insulating and has strong adhesion.**

Serving Through Science

UNITED STATES RUBBER COMPANY

1230 AVENUE OF THE AMERICAS • ROCKEFELLER CENTER • NEW YORK 20, NEW YORK

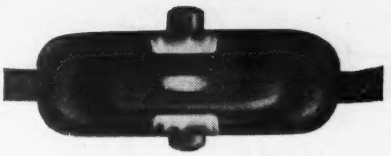
Connector



WINCHESTER CONNECTOR

This new multiple contact connector is particularly adapted to limited space applications where reliable plug-in operation is required. The rectangular monoblock connector can also be supplied with a self contained locking device which eliminates the necessity of any external clamping arrangement. Two heavy guide pins, acting as ground contacts, perform the additional functions of alignment and polarization. Contacts are designed for use with a maximum wire size of No. 16 AWG. It is available in two sizes, 18 and 12 contacts. The Winchester Co., 6 East 46th Street, New York 17, N. Y.

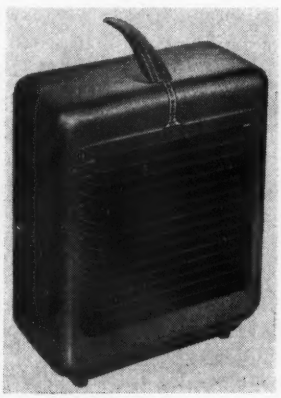
Safety Switch



TRILMONT SAFETY SWITCH

A new feed-through cord switch has been developed. It is a double-pole single-throw push-through cord switch, designed to operate on electrical devices rated up to 2500 watts a-c or d-c, 125 or 250 volts. It carries the Underwriter's Laboratory listing of 20 amperes at 125 volts. The switch mechanism consists of an easy-to-push, fast snap action over the center spring controlled tapered shaft. The tapered shaft passes through a plastic shorting bar, on which are mounted two silvered plates. The shorting bar moves the two silvered plates into an on or off position, making or breaking the power supply at four fixed silvered contacts. Each of the four contacts as a terminal screw for wire connections. Trilmont Products Company, 34th and Walnut Streets, Philadelphia 3, Pa.

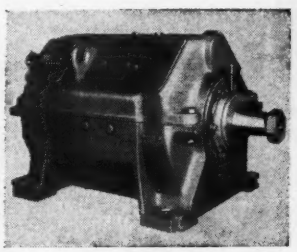
Electric Heat Fan



THERMADOR HEAT FAN

A new electric heat fan which warms in winter and cools in summer is now available. It utilizes the forced air principle. The unit is recommended for quick, clean warmth (or for circulating air) in the bathroom, den, playroom or in any room of the home, garage or office where an auxiliary unit is required. Dimensions are 11¾-in. high, 9¼-in. wide, 5⅝-in. deep. It is equipped with a handle that permits user to move it even when it is in operation. Available in 1650 watts or 1320 watts, 115 volts a-c. Thermador Electrical Manufacturing Co., 5119 District Blvd., Los Angeles 22, Calif.

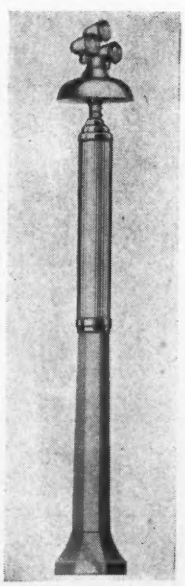
Motors



G-E MOTORS

A new line of d-c armored mill motors, Type MD-600, has been announced. They are designed in ratings from 5 to 200 hp. Solid roller bearings, close-coupled, are used throughout the new line, permitting greater load carrying capacity. Adaptability of the frame to various enclosures allows easy change over between protected, totally enclosed, or separately ventilated types. Reduction in size per horsepower has been accomplished by better utilization of space inside the machine. A redesigned internal ventilation system carries heat from the armature more efficiently for rapid dissipation. General Electric Company, Schenectady, N. Y.

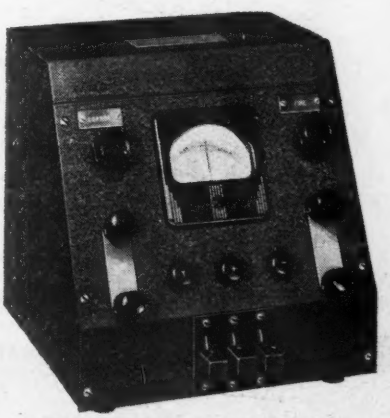
Island Lighter



REVERE PYLON-LITE

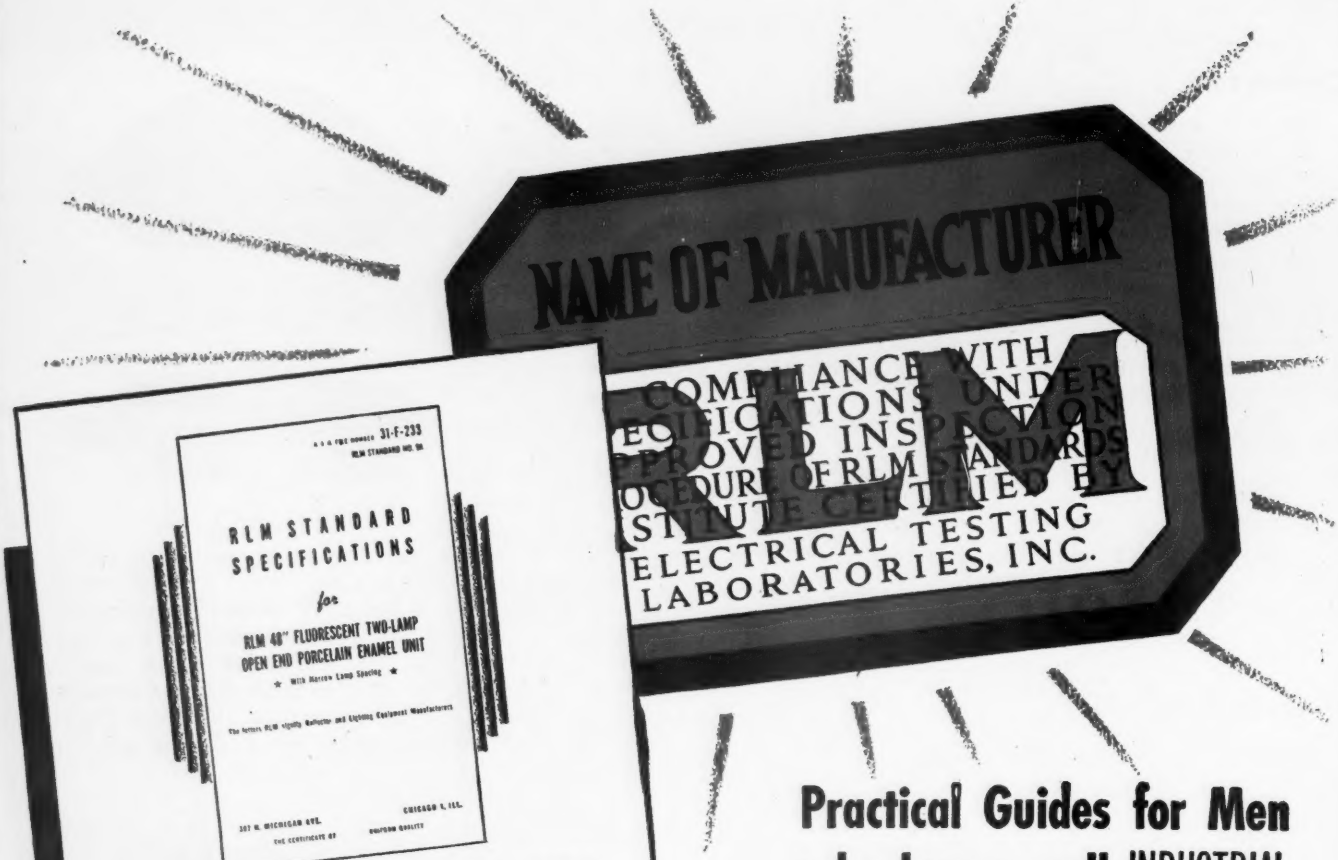
The "Pylon-Lite" utilizes fluorescent lamps in a column for lighting service station pump islands. It can be mounted on a short standard at the station island, on the property line, on the gasoline pumps or any other flat surface. In the upper casting there is a two inch slip fitter on which a short nipple may be fastened so that an island lighter or floodlight may be mounted on top. The eight inch cylindrical glass enclosure houses four or six instant start fluorescent or 42 inch Slimline lamps. These lamps are mounted in conventional sockets. Ballasts are located in the center of the fixture so that heat generated by the lamps will keep up the operating temperatures in cold weather. Revere Electric Mfg. Co., 6009 Broadway, Chicago 40, Ill.

Instrument



ASSOCIATED RESEARCH INSTRUMENT

This new low range limits bridge, Model 81-A, is particularly adapted to testing resistance values of motor windings, transformer primaries, or secondaries, rheostats, potentiometers, lamps, shunts or multiplier resistors. Resistance from a fraction of an ohm to 20,000 ohms may be checked to tolerances of plus or minus one percent to plus or minus 20 percent. It is self contained, using three No. 6 dry cells. Provision is made with binding posts for an external battery connection where higher sensitivity is required. Associated Research, Inc., 231 S. Green St., Chicago 7, Ill.



RLM SPECIFICATIONS COMPLETELY REVISED TO INCLUDE LATEST TECHNICAL DEVELOPMENTS

No. 100—Testing and Inspection Procedure
No. 1 RLM—Dome Reflectors
No. 2 RLM—Deep Bowl Reflectors
No. 3 RLM—Symmetrical Angle Reflectors
No. 5 RLM—48' Fluorescent Two-Lamp Closed End Porcelain Enamel Unit
No. 6 RLM—48' Fluorescent Three-Lamp Closed End Porcelain Enamel Unit
No. 7 RLM—60' Fluorescent Two-Lamp Closed End Porcelain Enamel Unit
No. 9 RLM—48' Fluorescent Two-Lamp Open End Porcelain Enamel Unit
No. 10 RLM—48' Fluorescent Three-Lamp Open End Porcelain Enamel Unit
No. 11 RLM—60' Fluorescent Two-Lamp Open End Porcelain Enamel Unit
No. 18 RLM—Glassteel Diffusers
No. 22 RLM—48' Fluorescent Two-Lamp Closed End Porcelain Enamel Unit with Longitudinal Louver
No. 23 RLM—48' Fluorescent Two-Lamp Open End Porcelain Enamel Unit with Longitudinal Louver

Practical Guides for Men who buy or sell INDUSTRIAL LIGHTING EQUIPMENT

When making plans for industrial lighting to take advantage of the latest developments in illumination engineering, play safe by specifying industrial lighting units built to conform to up-to-the-minute RLM specifications and identified by the RLM LABEL.

Every industrial lighting unit qualified to bear the RLM LABEL must conform to rigid RLM Official Standard Specifications that cover construction and performance factors vital to safety, lighting efficiency and economy. That is why it is so worthwhile to follow RLM Specifications in specifying, and to look for the RLM LABEL when buying Incandescent and Fluorescent industrial lighting equipment.

Copies of all the latest RLM Specifications, listed at left, may be secured through any manufacturer using RLM inspection and certification service, or direct from RLM Standards Institute.

The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE
INCORPORATED
307 N. MICHIGAN AVE. • SUITE 420 • CHICAGO 1, ILLINOIS

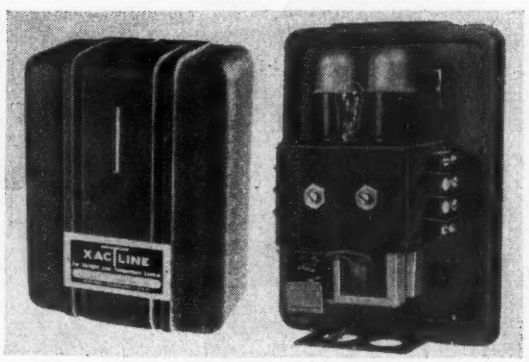
Motor Capacitor Housing

AEROVOX HOUSING

A general utility housing for motor starting capacitors, accommodating the standard 1⅜ in. by 3¼ in. unit, is now available. This housing, made of heavy gauge metal, completely covers and protects the capacitor and terminal assembly, and fits the motor frame contour. It provides a strong, rugged, shock-proof installation, according to the manufacturer. Once assembled, the capacitor cannot become damaged or displaced. No auxiliary caps or brackets are required. Aerovox Corporation, New Bedford, Mass.

Temperature Control Unit

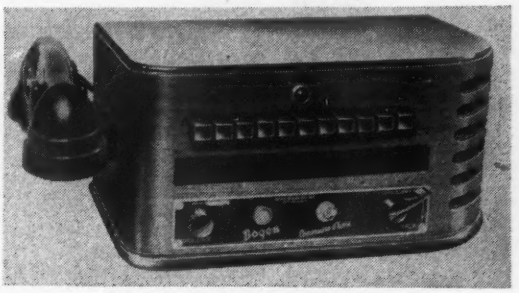
The new Xactline temperature control can be used on all types of electric furnaces, ovens, injection molding machines, etc., employing conventional millivoltmeter and potentiometer type controlling pyrometers or gas-fired equipment employing solenoid-controlled or motor operated valves. It is housed in a cast aluminum case 8¼-in. high by 6¼ in. wide and 3 in. deep, and designed for surface mounting installation. According to the manufacturer, it is a solution for costly overshoot and undershoot temperature variations prevalent in the plastic, molding, tempering, aluminum heat treating and other heat processing fields. Claud S. Gordon Company, 3000 S. Wallace St., Chicago 16, Ill.



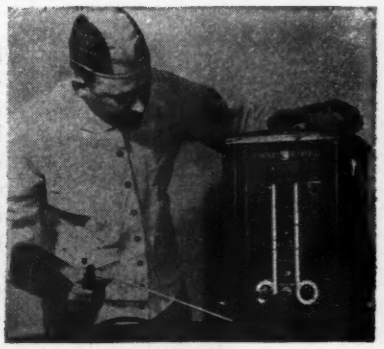
GORDON EXACTLINE

Inter-communicating Systems

A new "L" series of inter-communicating units has been announced. The "LA" series are for systems employing one master and a number of remote stations. Master stations may be equipped with earphone for privacy. The "LC" series comprise all master systems, providing a number of private simultaneous two way conversations between masters. The "LS" series provides systems in which a number of masters can operate in conjunction with a number of remotes. Master units are available in two types with either 10 or 20 selective pushbuttons. System operates on 110 volt a-c. David Bogen Co., Inc., 663 Broadway, New York 12, N. Y.

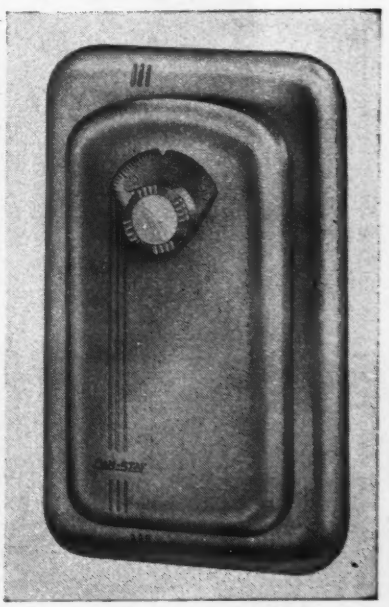

BOGEN COMMUNOPHONE SYSTEM

Arc Welder


G-E ARC WELDER

A new a-c farm and home arc welder designed for operation on single-phase lines of limited capacity supplying rural areas and small communities has been announced. The welder is furnished in two ratings, 130 and 180 amperes, either with or without capacitors. It has two plug-in connections for the electrode cable, one for use with 1/16 in. or 5/64 in. electrodes and one for 3/32 in., 1/8 in., and in the larger rating 5/32 in. electrodes. A welding current scale is calibrated in electrode sizes. General Electric Co., Schenectady, N. Y.

Thermostat

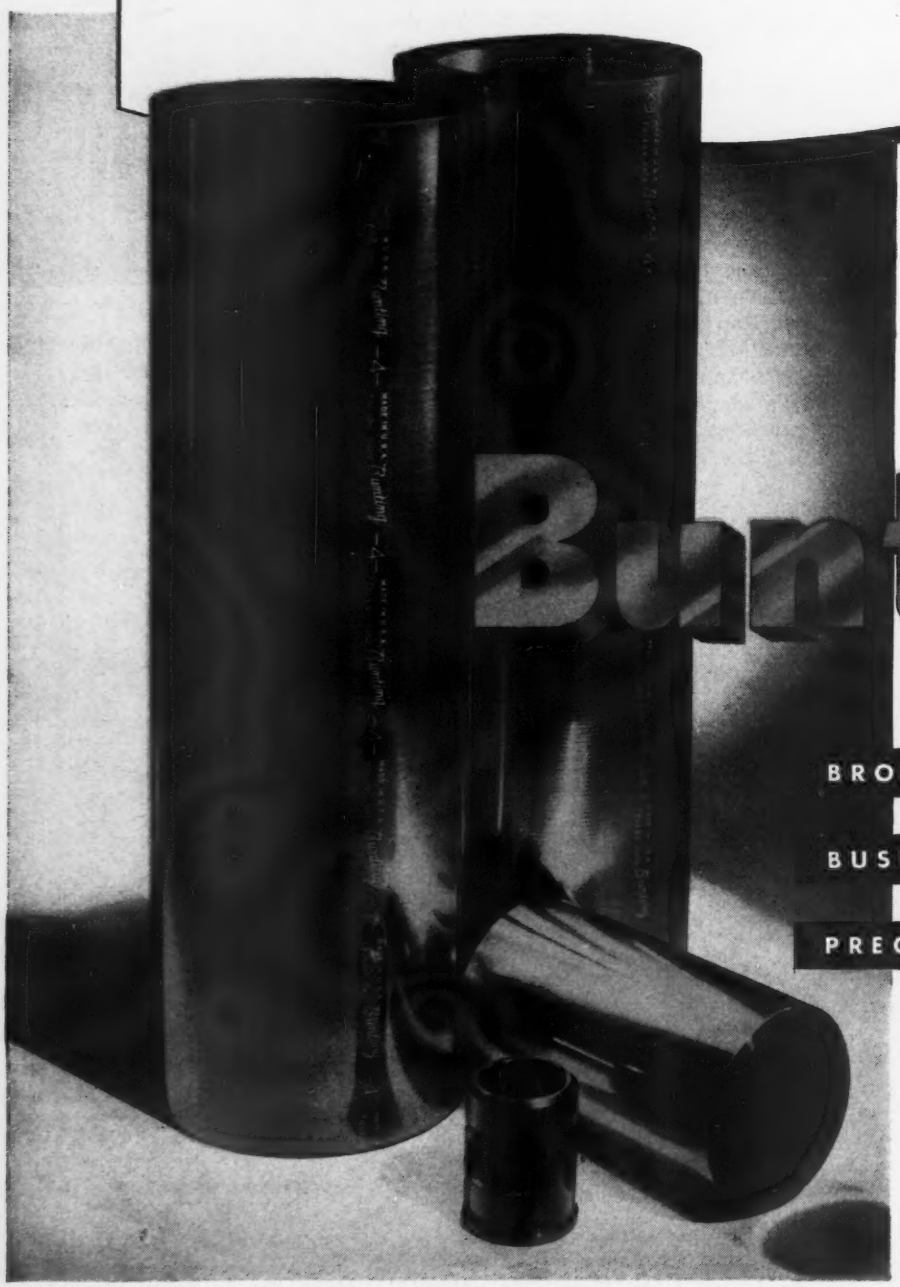

CAM-STAT THERMOSTAT

Model CD109A Cam-Stat, a new type room thermostat, is designed to blend harmoniously with any room interior. It is the size of an ordinary light switch and extends less than an inch from the wall. It is easily installed to a conventional conduit box. All current carrying parts are enclosed within the bakelite housing behind the wall plate. It is suitable for either line voltage or low voltage currents. Current carrying capacity is 1500 volt-amps., ½ hp., and 125 volt-amps. pilot duty at 120 through 240 volts a-c. Cam-Stat, Inc., 2037 South LaCienega, Los Angeles, Calif.

ONE mark of the Bunting Authorized Distributor is ability to deliver. Bunting Precision Bronze Bars and Standard Stock Bearings are a part of his capital invested in your community. Try him.

The Bunting Brass & Bronze Company, Toledo 9, Ohio.

Branches in principal cities.



Bunting

BRONZE BEARINGS

BUSHINGS

PRECISION BRONZE BARS

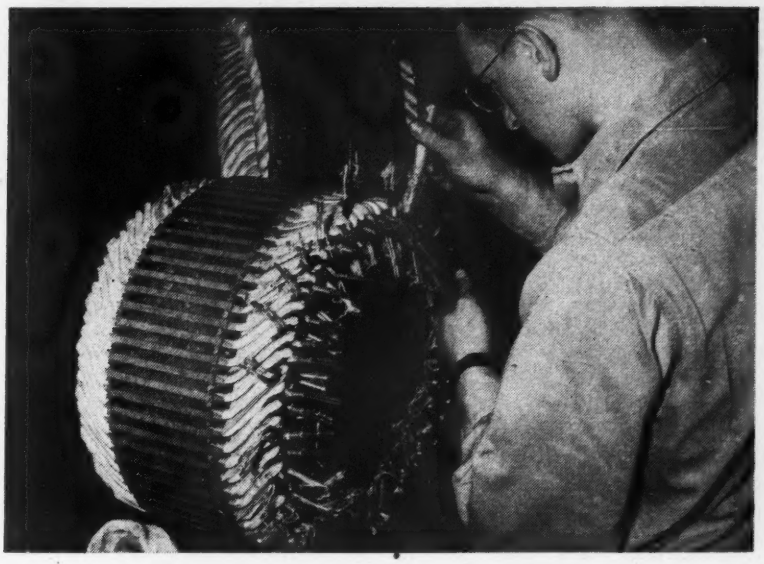
51

Motor Shops

Copper Sleeves Bind Rectangular Coils

Banding the loose ends of coils composed of multiple rectangular windings results in a stronger, more permanent and neater appearing job when accomplished by the method used by Palmer Electric Motor Repairs, Stamford, Connecticut.

Instead of binding winding groups with wire, rectangular copper sleeves are slipped over the ends and firmly soldered. The sleeves are formed from round copper tubing which is expanded with mandrels of the correct shape and cross-sectional area. The illustration shows a 5 hp. armature with coils being fitted with the discussed rectangular copper sleeves. Required binding time has been noticeably reduced.



Round copper tubing is expanded to the exact size and shape to slip over the ends of multiple rectangular armature windings.

Shop Device Forms Strip Copper Rings

Shop ideas submitted in last year's NISA Award Contest ran the gamut from the simple to the complex. Regardless of the category into which they might fall, all portrayed a common objective—to boost the quality and quantity of production in the motor repair shop; all testified to the ingenuity of the mechanics employed in NISA shops.

Among those recently released for publication by NISA headquarters was one of the entries submitted by William Embree of the Arthur Wagner Company in Chicago. This specific shop idea or "kink", call it what you will, is a device for rolling or forming copper strip into a flat or edgewise circle. In the motor repair field, shops frequently must fabricate flat copper rings for use inside the extension of the squirrel-cage bars on rotors, or edgewise circles for end rings of rotor bars. Mr. Embree's device was developed to enable the Wagner shop to do a better job of forming these rings and to do it in the shortest possible time.

The following description of his edgewire copper ring roller must, of necessity, tie-in directly with diagram of Fig. 1. The identifying letters in the sketch will be used as references in the discussion.

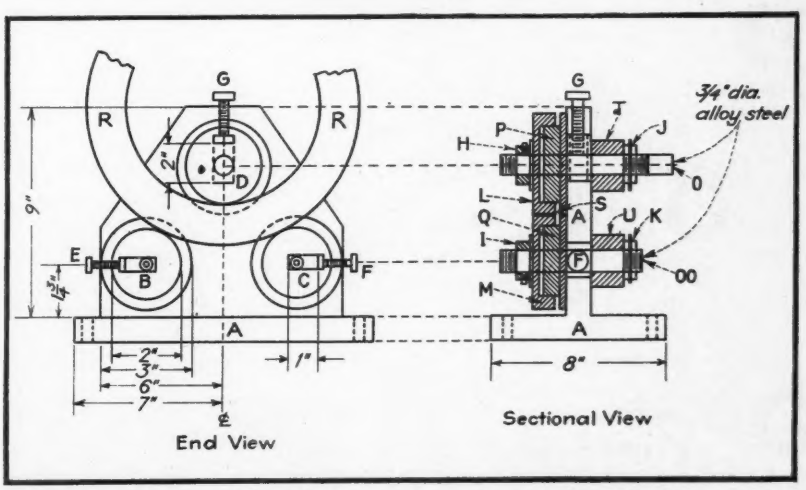


FIG. 1—Details of the design and operation of the edgewise copper ring roller developed by the Arthur Wagner Company in Chicago. Unit requires very little space as indicated by the dimensions.

The strip copper ring "R" (see Fig. 1, end view) is formed by three adjustable flanged rollers "B", "C" and "D", mounted as shown on a heavy steel or cast iron frame "A" and supported on stud shafts "O" and "OO" (see Fig. 1, sectional view) which have extension collars "T" and "U" to increase shaft bearing surfaces. Top roller "D" is keyed to shaft "O" and has a knurled surface which grips the copper strip and feeds it over the "idler" rollers "B" and "C".

Spacer-cups "L" and "M" which fit over the three rollers can be adjusted by set screw nuts "H" and "I" to provide any necessary adjustment in width of space "S" to accommodate copper strip of various thicknesses. Stationary nuts "J" and "K" at the other end of the shafts are held in position by pins.

Motive power for the device can be provided by a milling machine, lathe or other reversible drive connected to driving shaft "O". Or, the unit can be hand operated by a suitable crank arrangement. In any case, the frame

You get
ALL THREE with a
BLACKHAWK
PIPE BENDER

Blackhawk Benders do MORE than bend pipe. They include a Porto-Power Hydraulic Unit that performs this triple job:

1 PIPE BENDING
Bends rigid conduit and pipe of all popular diameters. Saves need for elbows, couplings and extra cutting and threading.

2 MAINTENANCE and PRODUCTION
Porto-Power pushes, pulls, bends, presses, spreads, and clamps—pulls gears, lifts machinery and licks scores of other jobs.

3 SPECIAL JACK
Compact Hydraulic Ram works in all directions — at any angle. A versatile, safe, remotely controlled jack.

Blackhawk Mfg. Company,
Dept.P20116, Milwaukee 1, Wis.
Mail Hydraulic Equipment catalog to:

Name_____
Company_____
Address_____

BLACKHAWK
WORLD'S LARGEST MANUFACTURER OF HYDRAULIC JACKS

"A" must be securely bolted to whatever machine or bench is used.

Operation of the unit is simple. The mechanic starts with a straight piece of copper strip long enough to form one or two complete circles of the desired diameter (the extra circle will be outside the unit and when complete will be cut into two rings). The three rollers are adjusted (screws "E", "F" and "G") for a larger diameter circle at first. The copper strip is passed back and forth over the rollers while the top roller "D" is adjusted to gradually decrease the diameter of the ring "R" to the predetermined value. Some slight adjustment may be necessary on the bottom rollers during the process. Such gradual formation of the circle eliminates kinks and irregularities in the copper.

The unit illustrated in Fig. 1 will accommodate strip copper with thickness ranging from $\frac{1}{8}$ in. to $\frac{3}{8}$-in., and width from $\frac{1}{2}$-in. to $1\frac{1}{2}$-in. Rings can be formed with diameters ranging from about 18-inches to three and four feet. It is used primarily for work on motors of 15 and 20 hp. up to 200 or 300 horsepower. Past experience at the Wagner shop has proved that a mechanic familiar with the device can bend a 12-ft. length of copper strip into rings in about five minutes time when using a motorized drive. Brass has been bent with equal facility on the unit.

Wire Stripping Variations

Several combinations of methods for removing damaged coils are employed in the Palmer Electric motor Repairs shop of Stamford, Conn. Cutting coil ends is accomplished with a foot press or a carborundum wheel, varnish is softened through baking, dissolving or burning, and stripping is with the aid of a converted deep-well motorized pump assembly.

Stators of small, split-phase motors, common in oil burners and refrigerator assemblies, have one end of their windings cut flush with the slot ends by means of a foot press which has been equipped with an off-axial, stepped cutting edge. This arrangement permits the cutting edge to be fitted under the overhanging circular casing of the stator. A steel base plate likewise projects away from the press axis and fits between the windings and the stator frame. Pressure on the foot pedal activates the cutting edge which shears off the windings against the steel lip pictured in Fig. 2. The stator is hand rotated as the coils are progressively cut.

Armature coils are cut flush with the winding slots at one-end by means of a high speed carborundum wheel. Fig. 3. The armature shaft rests in a pair of steel cradles and the armature is shifted laterally so that the slots closely approach the plane of the revolving disc. The cutting wheel is counterbalanced to spring up and away from the working area when not held down by hand pressure on a guiding lever. Water nozzles either side of the cutting disc direct cooling, washing streams against the wheel and armature windings during the operation.

Slot insulation is burned with a torch only in extremely stubborn cases, the majority of coils being loosened sufficiently through baking or boiling in a solvent.

Temperatures in the baking oven are maintained between 250 and 260 degrees F. and this heat generally softens the varnish sufficiently to permit

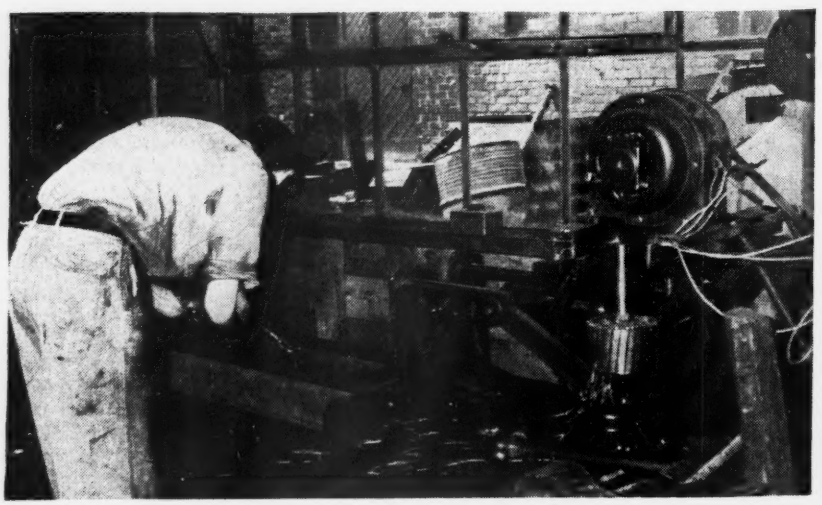
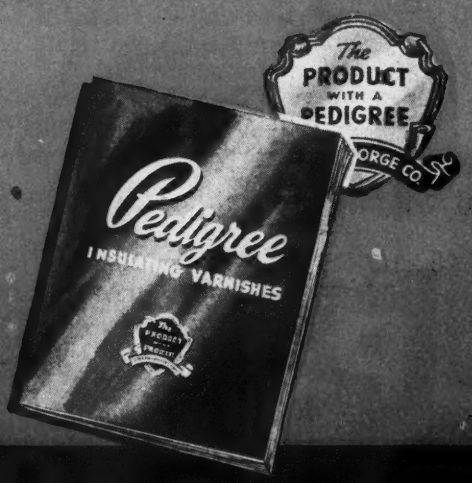


FIG. 1. After one end of coils are cut and insulating varnish has been softened, wire tongs grasp the uncut coil ends and strip the windings from their slots. A horizontally-mounted, reciprocating, motor-operated, converted deep-well pump assembly supplies the pulling force.

Get Acquainted with the Champion

Pedigree Varnishes

Write for your FREE copy of the Pedigree Varnish Catalog . . . packed with helpful information.



Discover for yourself the many reasons for the outstanding superiority of Pedigree Varnishes. Let their performance prove their merit . . . convince yourself that each one is a winner.

Distributed by

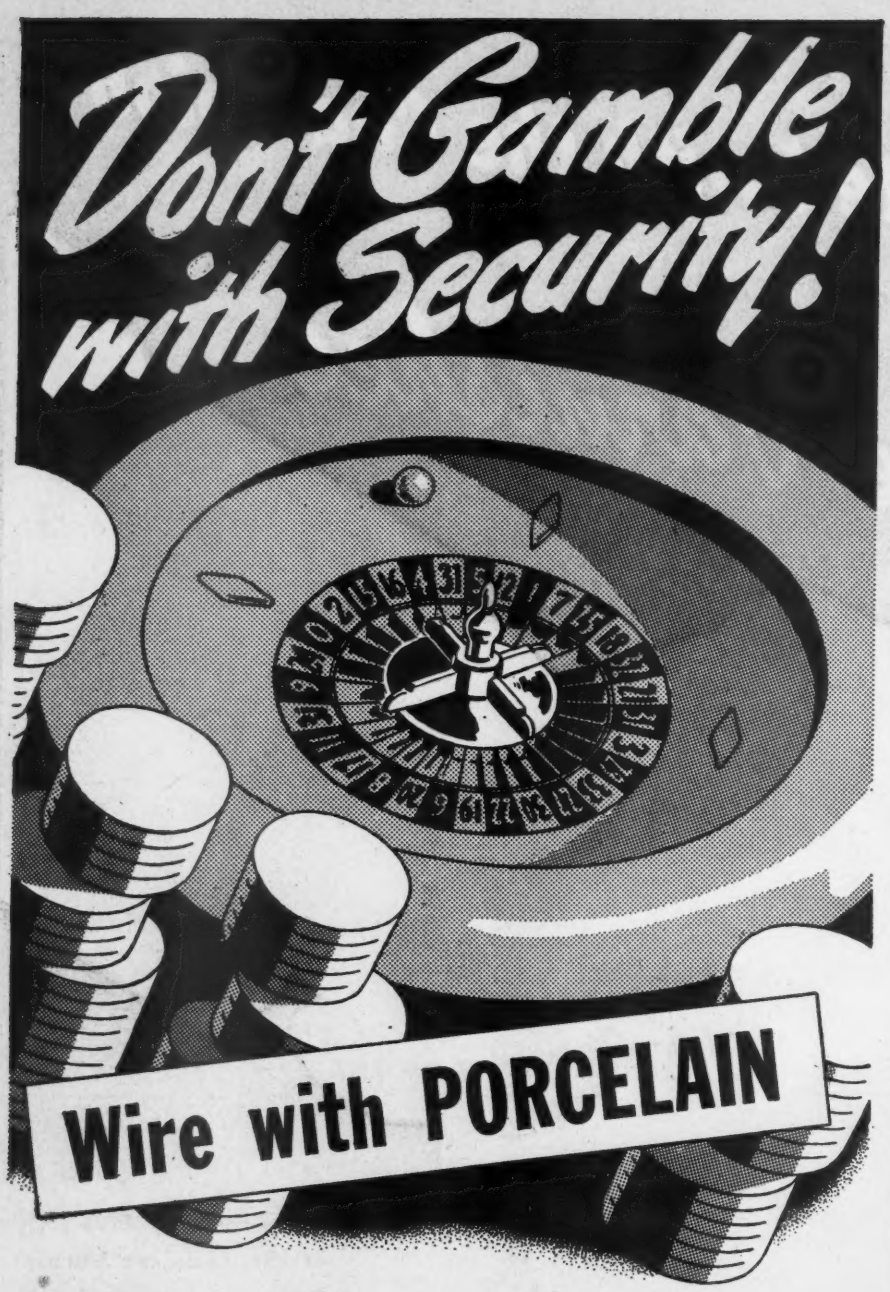
INSULATION MANUFACTURERS CORPORATION

INSULATION AND WIRES INCORPORATED

TRI-STATE SUPPLY CORPORATION

Manufactured by

THE P. D. GEORGE COMPANY, ST. LOUIS, U. S. A.



It's good business to recommend the *safest* wiring system for your customers—do the job with PORCELAIN Protected Wiring! This is a *completely* insulated system—based on using *insulating* (not conducting) materials for enclosures and supports.

Modern PORCELAIN Protected Wiring also offers time-proved advantages in permanence—economy—and ablility to carry a bigger load. Only the non-metallic way has a record of fifty years of efficient, dependable service. Ask your friendly Electrical Inspector about the safety and long-life features of knob-and-tube wiring. Write for wiring catalog.

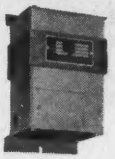
FIG. 12. Small, split-phase motor stators have their windings cut by a converted foot press as the first step in stripping damaged coils.

the coils being pulled from the slots. In cases where baking is not sufficient to loosen the binding properties of the varnish, armatures and stators are immersed in a boiling, gas-heated vat of "Magnus" cleaner and then rinsed.

Pulling the coils from the slots is by a horizontally-mounted, motor-operated, reciprocating, deep-well pump assembly. Constructed on a base of 8-inch I-beams, the coil puller holds the reciprocating pump machinery at one end and the armature being stripped at the other. The armature is firmly held in place by means of a jack screw and yoke and a hand-operated pair of wire tongs, connected to the pump by a chain, grasps the coils. The operator guides the tongs as the pump assembly supplies the required power. Fig. 1.

FIG 13. The ends of armature windings are sheared off by means of a carborundum wheel, water cooled by converging nozzles, and operated by means of a hand lever.

SORGEL AIR-COOLED TRANSFORMERS



¼ KVA. Single Phase
460/230 to 115 volt.

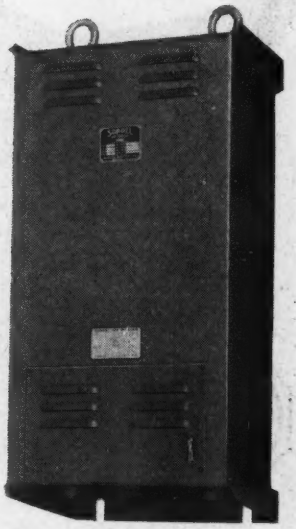
15 KVA. 3 phase,
Wall Mounting Type.

for Every Purpose

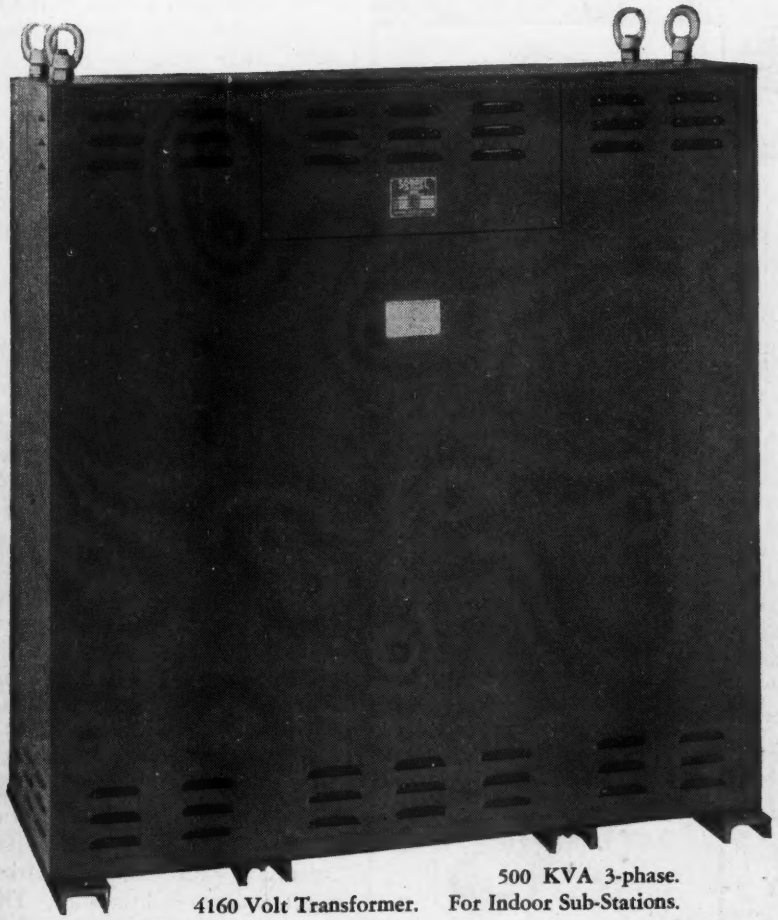
To operate 115 volt lighting and portable equipment from 230-460 or 575 volt power circuit.
¼ to 333 KVA. Single phase. 1 KVA to 1000 KVA, 3-phase.

To operate special equipment from standard circuits, to change odd voltages to standard voltages, and phase changing.

For interior high voltage distribution systems with transformers at load centers. Sizes up to 1000 KVA. Voltages up to 13,200.

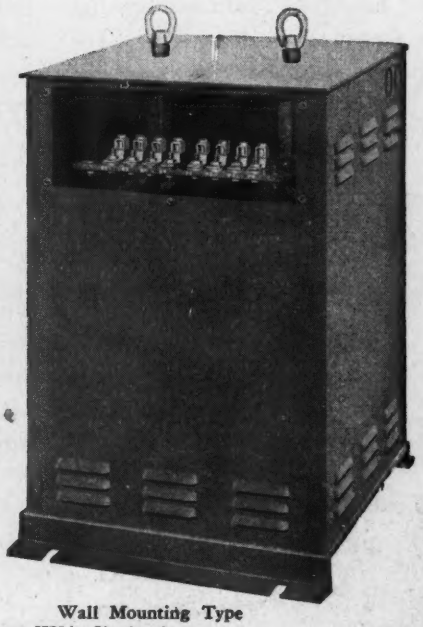


75 KVA. Single phase,
460/230 to 230/115 volt.



4160 Volt Transformer.

500 KVA 3-phase.
For Indoor Sub-Stations.



Wall Mounting Type
50 KVA, Single phase,
Floor Mounting Type.
With cover of connection compartment removed, showing solderless terminals.

SORGEL ELECTRIC CO., 836 W. National Ave., Milwaukee 4, Wisconsin

Pioneers in the development and manufacturing of Air-Cooled Transformers

ASK YOUR WHOLESALER!

Every electrician and contractor worth his salt watches the little things—like fittings . . . because they figure BIG on wiring jobs done *right!* That's the reason for GEDNEY care in turning out fittings that help you come out "on top".

★ HIGH GRADE MALLEABLE IRON
★ SMOOTH FINISH—INSIDE AND OUT
★ CLEAN ACCURATE THREADING
★ EVERY ITEM CAREFULLY INSPECTED

Conveniently packaged and clearly labeled for instant selection of the proper size and type for your job. UL approved. Look for the familiar box with the all-over GEDNEY trademark pattern and sturdy metal edges.

WRITE FOR COMPLETE GEDNEY CATALOG

GEDNEY ELECTRIC CO.
FOUNDRY, FACTORY & SHIPPING POINT: TERRYVILLE, CONN.
RKO BLDG., RADIO CITY, NEW YORK 20, N. Y.

LONDON AIRPORT WIRING

[FROM PAGE 53]

yet been designed but the system will most likely be a series (constant current) system but individual series transformers will be used for each fittings.

The cable for the future installations will be paper insulated lead covered unarmoured. Joint boxes accommodated in the pit adjacent will be cast iron compound filled with compression glands for the incoming cable. A diving bell cover has been provided to take care of a temporary rise of water in the pits and duct system.

NAVIGATIONAL AIDS—Wherever possible radio stations, instrument landing systems and navigational aids etc., will be supplied from the Airport power supply with the advantages of standby facilities.

At present HF/DF and VHF/DF radio facilities, S.B.A. main beacon, S.C.S. 51 localiser, S.C.S. 51 boundary marker, S.B.A. inner marker and S.C.S. 51 middle marker are supplied from the airport system, S.B.A. outer marker, S.C.S. 51 outer marker and radio range being too far away have been supplied from the local electricity supply undertaking.

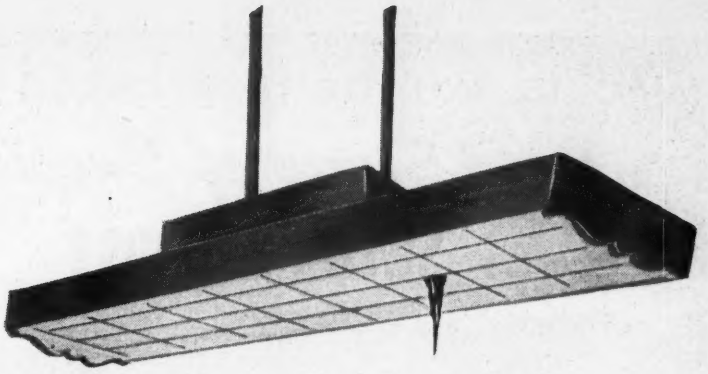
Angle of approach indicators are installed at the end of each runway. By means of coloured beams these optical systems give pilots correct angle of glide on to the runway.

STRAIGHT APPROACH LIGHTING presents one of the most difficult engineering problems because of the necessity of erecting poles in funnel formation for 3,000 yards through built up areas at the end of all runways.

The temporary approach lighting in the present set-up extends only 1,500 yards from the ends of the runways, with each funnel consisting of lights spaced at 500 yard intervals. Ordinary sodium street lights turned upside down suffice for the present. Steps are being taken to modify street lighting in the vicinity to avoid confusion.

The ultimate approach lighting scheme calls for a double line of lights diverging at 2° and extending for 3,000 yards from the end of each runway. These lights will be spaced at 100 yard intervals with distance markers at quarter points and the ends. The type of pole has not been decided definitely but is most likely to be spun concrete and about 30 ft. high.

OTHER LIGHTING—Provision also has been made for threshold bars of lights to mark the beginning of each



IS THIS *DRIP** NECESSARY?

***Prevent it . . . with* CERTIFIED BALLASTS**

People in the lighting business . . . and some unfortunate users . . . know that this trouble comes from an improperly installed, *overheated* ballast in a fluorescent lighting fixture.

Protection against overheating is only one result of the many rigid manufacturing specifications under which CERTIFIED BALLASTS are built. They are tested, checked and *Certified* as meeting these specifications by impartial experts, Electrical Testing Laboratories, Inc. That means assurance of good lamp performance, good fixture operation and minimum service worries.

CERTIFIED BALLASTS, properly installed, will not drip—will normally outlast the entire lighting installation . . . and they cost no more than any other ballasts. So why not be sure? Look for the ETL Certification mark on the equipment you specify.

CERTIFIED
E·T·L·
SPEC. NO. 6
HIGH PF

***The compound inside a ballast, used to deaden sound and hold parts in place, melts under excessive temperatures.**

Certified Ballast Manufacturers

Makers of Certified Ballasts for Fluorescent Lighting Fixtures

Acme Electric Corporation
Cuba, New York

Chicago Transformer Div.
Essex Wire Corporation
3501 Addison St., Chicago, Illinois

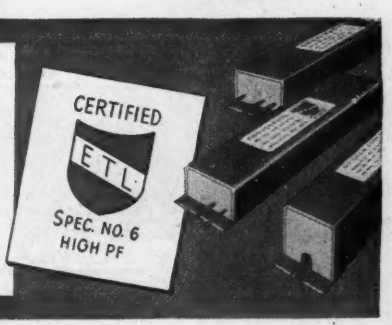
General Electric Co.
Specialty Transformer Division
Fort Wayne, Ind.

Jefferson Electric Co.
Bellwood, Illinois

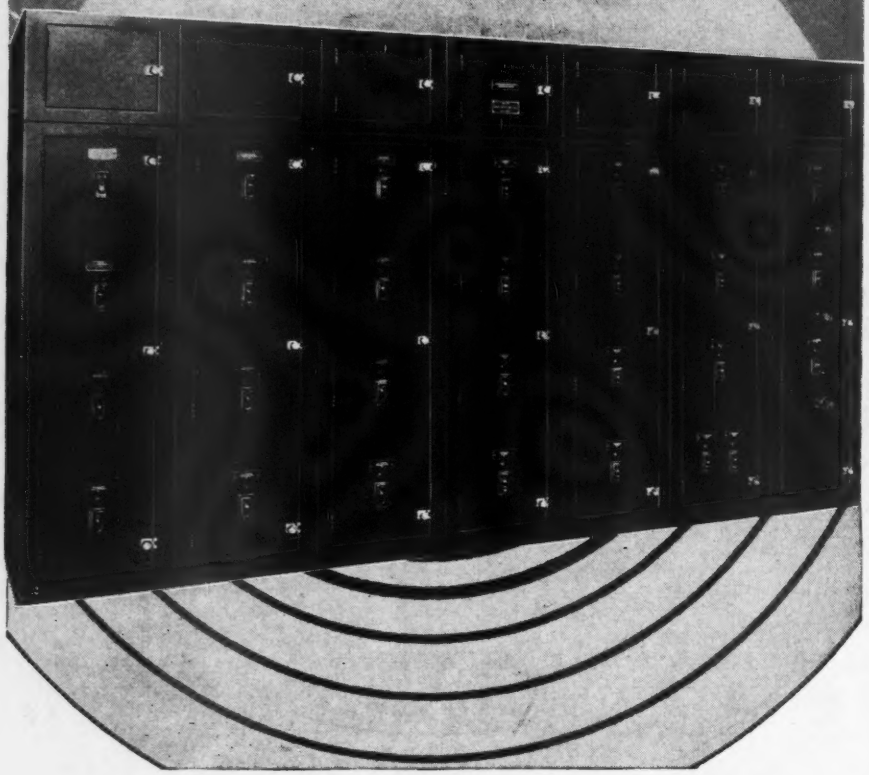
Sola Electric Co.
2525 Clybourn Avenue
Chicago 14, Illinois

Starring and Company
Bridgeport, Conn.

Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.



Would you be interested—in
a *Better Source of Supply*
for SWITCHBOARDS?



Engineering Service that's Unusually Helpful. No matter how difficult your problems of design, our engineers have probably solved them . . . exceptional experience in planning every kind of switchboard and special panelboard. We take full responsibility for meeting all applicable specifications and requirements.

Highest Quality, Exclusively. The best of materials and skilled workmanship, backed by rigid engineering inspection. Every Pelham switchboard and panelboard is guaranteed to give completely satisfactory service.

Dependable Deliveries. Special switchboards are designed and built with unusual promptness. Our deliveries are made when promised.

Call your Pelham representative, or write or wire the factory.

PELHAM ELECTRIC MANUFACTURING CORP., ERIE, PA.

SPECIALIZED DESIGN
Pelham
UNEXCELLED QUALITY

SWITCHBOARDS • PANEL BOARDS • SWITCH GEAR AND ACCESSORIES

runway and intermediate bars at quarter points of the runways. The same concrete fittings and the same type of lights used for the flarepath will be installed for this purpose. The colour scheme has not yet been determined.

POWER SUPPLY—The present lighting system for the initial runway triangle and temporary facilities is served by a temporary substation.

The ultimate scheme may call for incoming supply being handled on two independent systems. The main substation will be incoming at 22 k.v. stepping down to 11 k.v. and the stand-by supply will come in at 6.6 and step up to 11 k.v.

The primary distribution system will be designed as a ring to facilitate continuity of supply for either of two substations. The actual loads and commitments are not yet known.

Substations will be placed on the 11 k.v. system at convenient points to feed power requirements for various load centres such as airfield lighting, hangarage areas and terminal area. Secondly, distribution schemes will be arranged from these substations at 400 volts, 4-wire, 50 cycles supply.

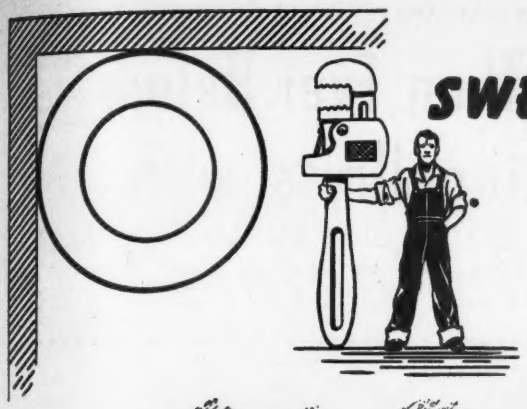
A multi-core paper insulated lead covered type cable is being laid to form a control network similar to the 11 k.v. network for purpose of remote control of lighting and other services which have to be remotely switched from the control tower.

The power supply for the straight approach funnels will come from substations mid-way along their length fitted from the centre as the object of reducing the volt drop over the full length with corresponding reduction in cable size.

SUB-SECTION SUPERVISORY CONTROL—Investigations are going forward now into the method to be adopted for supervisory control of aircraft traffic so that all movements of aircraft will be indicated in the Flying Control Office. All known methods and devices are being investigated from a simple trip pad to radar.

When the airfield reaches its zenith (an expected 130 aircraft movement per hour) it is also planned to have a similar control system for supervising incoming planes preparing to make landings.

G. P. F. Lister, who is mechanical and electrical engineer for the London airport project, played an important part in Britain's gigantic wartime aircraft building program and has been with the Air Ministry Works Directory since Britain entered the war in 1939.



SWELL BUSHING... but how do I tighten it in a spot like this?

You don't, Buddy . . . you SWITCH TO an O.Z!

In tight spots, too— O.Z. INSULATED BUSHINGS are O.K.

In tight spots—where there's no room for a wrench—you'll appreciate the *grooved* malleable iron base of O. Z. insulated bushings.

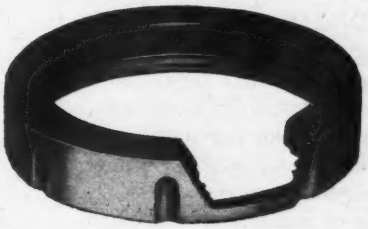
In *any* application where wire, emerging from a conduit, is bent or vibration is encountered, you'll like O. Z. insulated bushings because high-insulating Bakelite is molded and locked to a metal base.

METAL BASE means extra installation economies.

- **No stripped threads:** O. Z. insulated bushings tighten all the way down on the conduit without stripping bushing threads!
- **No inside locknut:** Deep metal base *alone* secures and grounds box to conduit!

CAPPED, TOO . . . to keep inside of conduit clean until cable is pulled.

Local suppliers almost everywhere can give you O. Z. bushings and other O. Z. products *right off the shelf*. Get in touch with your supplier today.



Other types, too—Shown is O. Z. insulated bushing Conduit Type B. . . . O. Z. also makes set screw type insulated bushings, bushings for thin wall conduit, and *grounded* insulated bushings in regular, thin wall, or set screw types.

O.Z. ELECTRICAL MANUFACTURING COMPANY

262 BOND STREET · BROOKLYN, 2 N. Y.

1765

They're OK if they're O.Z.

CONDUIT FITTINGS • CABLE TERMINATORS
CAST IRON BOXES • SOLDERLESS CONNECTORS
GROUNDING DEVICES • POWER CONNECTORS

There is More Reason Today Than Ever Before to Specify Benjamin Lighting Units with *Porcelain Enamel Reflectors!*

The many important advancements made in all types of reflector finishes have left unchanged the 3 BIG REASONS for Porcelain Enamel's TOP RATING!

Advancements in porcelain enameling make possible lighting reflectors with even greater resistance to weather, chipping, acids, thermal shock, etc. However, while these advancements give added reason for its specification, basically the reasons for its TOP RATING remain the same. They are:

1. DURABILITY

TOP RATING in durability goes to porcelain enamel. Reason: porcelain enamel is an inorganic finish, being literally rock fused on steel. Hence, unlike organic finishes, porcelain enamel is *not subject* to oxidation and deterioration from the effects of time, heat, sunlight and atmospheric conditions.

2. REFLECTIVITY

TOP RATING, here, because with porcelain enamel you get a lighting unit which not only has a light diffusing reflection factor of 80% or more, but also one that will *retain* this efficiency for a *life-time*. For, although the better organic finishes now possess initial qualities of reflectivity the equal of porcelain enamel, only porcelain enamel has been so completely time tested. Years and years of service experience prove that porcelain enamel retains its light reflecting qualities throughout a life time of service without appreciable loss.

3. CLEANABILITY

TOP RATING goes to porcelain enamel. Because its dense, glass hard surface prevents dirt and oils from becoming embedded . . . because of its extreme resistance to scratches, marring, chipping . . . because it cannot oxidize or corrode . . . porcelain enamel surfaces are the most easily cleaned; require only soap and water washing.

ENAMEL SEALS AGAINST CORROSION

To be Sure you Get Reflectors Embodying the Latest Developments in Porcelain Enamel . . . Specify BENJAMIN LIFE-TIME PORCELAIN ENAMEL REFLECTORS . . . Years of pioneer leadership in the development of special light reflecting enamels and finer production methods employed in Benjamin's own porcelain enameling plant insures porcelain enamel of a uniform quality that is warranted to meet all recognized industry specifications including those of the RLM Standards Institute.

Remember: **For Durability . . Reflectivity . . Cleanability . .** *Specify*

BENJAMIN
TRADE MARK

LIFE-TIME PORCELAIN ENAMEL

Lighting Equipment

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

BENJAMIN ELECTRIC MANUFACTURING COMPANY

DES PLAINES, ILLINOIS

Industrial Electrification

ENGINEERING • INSTALLATION • MAINTENANCE

Overload Protective Devices—Part I

The first of a series of articles reviewing circuit protective methods. This article discusses fuses and circuit breakers.

By C. F. Hedlund
Electrical Engineer
Associated Factory Mutual Fire Insurance Companies, Boston, Mass.

The importance of providing proper and adequate protection for industrial electrical distribution systems and equipment is too often overlooked or ignored by those responsible for the electrical installation. In some instances the need is not thoroughly understood by the management, who are consequently unwilling to approve of an expenditure from which there is derived no visible return, particularly when the electrical equipment seems to be operating satisfactorily without such devices. In most plants the continuity of production is entirely dependent upon the electrical distribution system and its power supply. Failure of either one means a shut-down. The loss of use of a motor driving a "key" machine, due to trouble which could easily have been avoided by the provision of proper overload protective devices has very frequently been the cause of an extended interruption to production and spoiling of material in process.

Despite the importance of the electrical distribution system and the equipment to the average plant it usually represents only three to about twelve percent of the total investment, depending upon the type of industry. Because of its importance and its low proportionate cost there should never be any hesitation in providing adequate high quality protective equipment. The operating experience over a period of years as a result of the lack of interruptions and decreased maintenance costs, and absence of fires due to electrical causes will demonstrate the economy of such practice.

The records of the Associated Factory Mutual Fire Insurance Companies for the past ten years show that an average of about 20 percent of all fires which occurred in industrial plants and for which claims were made were due to electrical causes. Of this amount at least 10 per cent were the result of inadequate overload protection. Last year all power was interrupted to a large new war plant because of the lack of proper overload protection on the primary side of a transformer bank when a short circuit occurred in the secondary bus-bars. The transformer was badly damaged and a severe oil fire followed. About two years ago at a new mid-western steel plant a fault occurring on the trolley system of a yard crane cascaded through various missing and inadequate protective devices back to the substation of the utility company and interrupted all electric power to the plant, as well as causing the failure of an important transformer bank and destruction of important switching apparatus, on the plant premises. This was a war plant and the need for the products of the plant was of such urgency that it was started up without adequate protective equipment which couldn't be immediately procured at the time.

Many other cases where protective apparatus was either lacking or inadequate could be cited if space permitted, but it is desired only at this point to emphasize the great need for providing adequate and reliable protective devices for electrical circuits and apparatus. The remainder of this article will be confined to a description of the more common overcurrent devices available to prevent such troubles in electrical plants.

FUSES

The most common form of device installed on an electrical circuit for the purpose of interrupting the flow of current when an abnormal current condition occurs, is the fuse. It is usually the most economical means of providing overcurrent protection for electrical circuits and apparatus, but it has its limitations. Except for special applications fuses are normally used on circuits up to 600 volts and 600 amperes. Beyond these values oil or air circuit breakers are more commonly used, especially for indoor installations, although special fuses having high current interrupting capacity are now available and are being used where it is practical and advisable to avoid the cost of an expensive circuit breaker.

Underwriters Laboratories' approved fuses are designed to safely interrupt short circuits of 10,000 amperes, but in many plant distribution systems today this would be entirely inadequate to cope with the currents that could exist under short circuit conditions. Under these circumstances it would be necessary to use a circuit breaker, or if conditions are suitable, the special high interrupting capacity fuses. The latter should only be used where competent electricians are available and installed on circuits not exceeding 7500 volts and 100 amperes, or 2500 volts to ground and 300 amperes in accordance with the existing

National Electrical Code requirements. (Due to improvements in design the 1946 Code will permit such fuses to be used on circuits up to 15,000 volts for the protection of indivdual feeders, motors, and transformers).

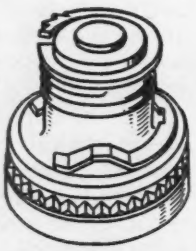
PLUG FUSES

These are provided with an "Edison" base which is the screw shell type, and are most commonly used on lighting circuits and for the protection of small motor circuits and appliances. The National Electrical Code limits their use to circuits of not over 125 volts and 0–30 amperes. On 115v./230v.-3- wire circuits in which the neutral is grounded plug fuses are acceptable in the ungrounded legs as the voltage to ground is 115 volts and, therefore, does not exceed the prescribed Code limitations.

The Code requires that 0–15 ampere plug fuses be distinguished from others of larger ratings by having an hexagonal window in the cap, or by some other prominent hexagonal feature such as the form of the top of the cap itself or a hexagonal recess or projection in or on the cap.

The 16 to 30 ampere fuses are easily distinguishable at a glance as being larger than 15 amperes by the fact that there is no hexagonal marking or shape in their design.

TYPE S FUSES



Type S Fuse

Illustration shows the Type S fuse which the 1946 edition of the National Electrical Code will call for wherever plug fuses of 30 amperes or less are required. (Until further study is made this rule is advisory rather than mandatory.) They are designed so that they cannot be easily bridged or otherwise tampered with, especially to prevent the dangerous practice of overfusing lighting circuits. The Type S fuse like the Edison-base plug fuse is approved only for circuits not exceeding 125 volts. They can be installed in their special fuse-holder or, by use of a special adapter (Illustration) in any Edison-base fuse-holder. Like the Edison-base plug they are made in two classifications, the first of which includes those rated from 0 to 15 amperes, and the second those rated from 16 to 30 amperes and are so designed that those of the 16 to 30 ampere rating cannot be used in an adapter or fuse-holder for the 0–15 ampere rating. The adapters are constructed in such a manner that once they are screwed into an Edison-base fuse-holder they cannot be removed or tampered with except with difficulty. In existing installations adapters without the locking device may be used if desirable.

Adapter

CARTRIDGE FUSES

Approved cartridge fuses are available in ratings of 0-600 amperes for circuits up to 250 volts and also for circuits of higher voltages up to 600 volts in the same ampere ratings. Up to 60 amperes the ends of the fuse are provided with ordinary ferrules which fit tightly in the contact clips, above 60 amperes the ends are fitted with knife blade contacts.

The so-called "one-time" or non-renewable cartridge fuse consists of a fusible element enclosed in a hard fiber tube or casing which is filled with a fuse filler especially compounded to aid in the interruption of the short circuit current. The ends of the fusible element are connected to metal ferrules or knife blade contacts attached to each end of the tube.

The renewable cartridge fuse is one in which the casing can be opened and fused links replaced but is like the "one-time" fuse in other physical characteristics.

Fuses with time delay, or as otherwise called "time-lag" characteristics, are designed to withstand the heavy starting currents on motor circuits but will blow when a short circuit occurs. Some special types, which will be later described, will also protect the motor against unsafe running conditions.

Illustration shows one type of renewable fuse which has a longer time lag than the ordinary type fuse. This type is designed for use on motor circuits to provide the required short circuit protection for the branch circuit conductors and the motor, and at the same time prevent unnecessary interruptions due to "blowing" of the fuse during momentary current surges, such as occur during starting periods.

Super-lag Renewable Fuse

SPECIAL FUSES FOR OVERLOAD PROTECTION

Fuses of this type are essentially an ordinary fuse to which a thermal cutout has been added. They are available in both the plug and cartridge types in the same sizes as the standard Code fuses for circuits up to 600 volts and 600 amperes.

One of this type, the "Fusetron" below looks like an ordinary cartridge fuse but it contains a dual element consisting of a fuse link and the thermal cutout, the former takes care of heavy overloads above 500 percent and the latter handles other overloads under 500 percent. The fuse link in this case is made of copper because it is designed to function on short circuits and not on overloads and it does not usually get hot except on short circuits when the heat lasts only for an instant. When an overload occurs the excessive current causes heating of the coil of the thermal cutout at one end of the Fusetron which in turn heats the copper bar in the center. When this piece is heated to the melting point of the solder in the thermal cutout the Fusetron opens up.

Fusetron, Knife-Blade Contact Cutaway view.

Other fuses with similar characteristics known as "Fustats" and "Therm-A-Trips" are also available in the plug type with an Edison base and also with the tamper-proof base. The Edison base type is not approved by the Underwriters' Laboratories for motor protection because it is interchangeable with ordinary fuses or larger ones of this type, so that the desired protection can be lost. The tamper-proof type is approved because the fuse-holder, or the adapter if used with Edison-base fuse-holders, limits the size of the fuse that can be used.

When using Fusetrons or Fustats, or any approved devices of this type, for running overcurrent protection of motors, care should be taken that the proper size is selected to conform with the full load rating of the motor.

HIGH VOLTAGE FUSES

These are divided into four main classes, each of which incorporates in their construction different means for extinguishing the arc which results when the fuse melts with an overload or short circuit occurs. They range in size of 1 to 400 amperes and are designed for use on circuits of voltages up to 132,000 volts, depending upon the make and type.

The first class consists of a fuse wire confined in a fiber tube which is usually enclosed in a porcelain housing and used on distribution circuits and on station apparatus up to 7000 volts.

The second class consists of a fuse in a strong metal housing filled with transil oil wherein the oil helps to extinguish the arc when the fuse melts on excessive current. It is used on

circuits up to 7500 volts for high current capacities to protect small transformer banks and distribution apparatus.

The third class consists of a fuse in a strong glass tube filled with a special liquid, such as carbon-tetrachloride, or a solution of it, to aid in quenching the arc. This liquid does not freeze or congeal so that there is no danger in using it in cold climates and is available for all ratings up to 132,000 volts. Resistors are often used in series with the latter type of fuse to limit the flow of abnormal current through the fuse and to aid in opening the circuit when a fault occurs.

The fourth class of high voltage fuse is the current limiting power fuse for use on circuits of 2300 to 34,500 volts. These have high interrupting capacities, will clear a short circuit in less than one-half (½) cycle, they are silent in operation and will discharge no gas, flame, or metal particles and do not require a current limiting resistor. They are constructed of one or more silver conductors wound on a ceramic core and sealed in a Pyrex tube. The space between the tube and the ceramic core is filled with a granular quartz and the ends of the silver conductors are welded to copper strips which are in turn welded to the ferrules. A small chamber in the bottom contains a gas producing chemical located above a thin copper disc which is cupped inwardly and forms the bottom of the fuse. When the fuse blows the copper disc bulges outward and serves as a target indicating that the fuse has operated. They are used for branch circuit protection of 2300 volt motor circuits and for service with potential transformers and control power transformers.

There has been developed comparatively recently an expulsion fuse of the class first mentioned, for use both indoors and outdoors for circuits of 440 volts and up to 34,500 volts. These have high interrupting ratings and the fuse element is attached to a coil spring and enclosed in a porcelain tube lined with boric acid. When the fuse melts the arc is drawn into the tube where it is extinguished by water-vapor evolved from the boric acid.

LINK FUSES

This is the oldest type of fuse, the fusible element is not enclosed and it is limited by the Code for applications in excess of 600 amperes and not over 250 volts, and then only by special permission of the authority having jurisdiction. They are usually made of a copper strip, the middle portion of which is considerably smaller than the ends. They are used rather infrequently and then usually for service entrance switches or on safely located switchboards for 250 volt systems.

CIRCUIT BREAKERS

A circuit breaker is a mechanical device installed in an electric circuit designed to open the circuit without injury to itself when abnormal conditions arise. It may be arranged to open either manually or automatically, but the term as used in the National Electrical Code applies to the automatic type only. In cases where the current normally exceeds 600 amperes circuit breakers must be used, except that fuses may be used in multiple for the protection of main conductors but not for motor branch circuits, provided all fuses are of the exact same size and characteristics. When the voltage exceeds 600 the Code also requires, with some exceptions, that circuit breakers be installed. While they are considerably more expensive than fuses they afford excellent protection and possess the following desirable features that fuses do not have.

1. They can be quickly reset each time an interruption occurs with less trouble than there is involved in replacing a blown fuse, which can also be hazardous if done by an inexperienced person. Where interruptions are costly the saving in time is an important factor, as it takes considerable time in some instances to locate the blown fuse, find a suitable replacement, and reinstall it.
2. They can be operated electrically from remote locations.
3. They can be arranged with other attachments to provide almost any type of automatic protection desired.
4. They reduce the hazard of single-phase operation such as occurs when one fuse on a three-phase circuit fails.
5. Afford more selective tripping in connection with other protective devices on the system.

AIR CIRCUIT BREAKERS

Circuit breakers are available in two types; the air circuit breaker and the oil circuit breaker. As its name implies the air circuit breaker is so called because the breaker contacts open in the air and they are equipped with barriers, arc chutes, air-blast apparatus and other means of cooling and extinguishing the arc when the current in the circuit is interrupted by the opening of the contacts.

OIL CIRCUIT BREAKERS

In these devices the current carrying contacts open under oil which helps to extinguish the arc due to its cooling effect and the oil pressure. They are used for all voltages above 600 and in many cases above 220 volts as a matter of preference. They are available with interrupting ratings as high as 2,500,000 kva. and for ratings up to 287,000 volts.

INTERRUPTING CAPACITY

The interrupting capacity of a circuit breaker is of primary importance as it determines the ability of a breaker to open a circuit safely, when short circuit conditions exist. For a-c circuits the interrupting ratings are given both in kva. and in amperes. The former represents the product of the rated voltage and the interrupting rating in amperes multiplied by the square root of three; the latter represents the highest "rms" (root mean square) value of current at the rated voltage that the breaker can interrupt without emitting flame or an appreciable quantity of oil, or being mechanically damaged. The ampere interrupting ratings for oil circuit breakers are based on the standard duty cycle which assumes that the breaker will interrupt a circuit twice in succession with a 15-second interval between each interruption (for non-oil-tight breakers this interval is two minutes) and then will be able to carry its normal current until such time as convenient to inspect it and make any necessary adjustments or repairs. However, it is not to be inferred that the breaker will not exceed its rated temperature rise or meet its interrupting rating again after operating under these conditions unless it has been inspected and reconditioned if necessary.

SHORT TIME OF MOMENTARY CURRENT RATING

While a circuit breaker may mechanically and thermally perform satisfactorily at its rated interrupting capacity it may not be able to withstand the momentary current which occurs during short circuits on a-c circuits for the brief period before the breaker contacts open, and which depends upon the characteristics of the entire connected system. Circuit breakers are given a momentary current rating in amperes which is equal to or greater than the interrupting rating and is determined by the system impedances as viewed from the point of fault.

CONTINUOUS CURRENT RATING

The current carrying rating of the circuit breaker is given in amperes, which indicates the maximum current the apparatus will carry continuously without causing overheating or damage to any part of it.

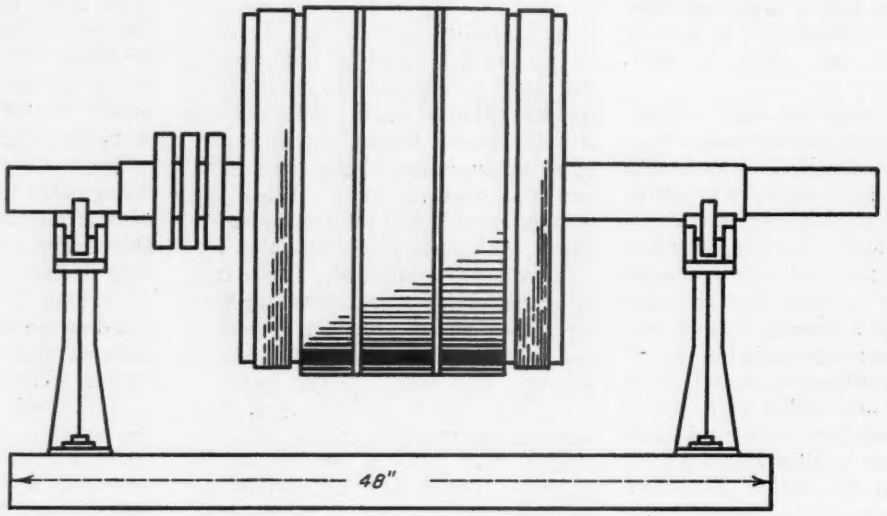
DATA SHEET

The number at the right is a classification for convenience in filing and for a future data sheet index

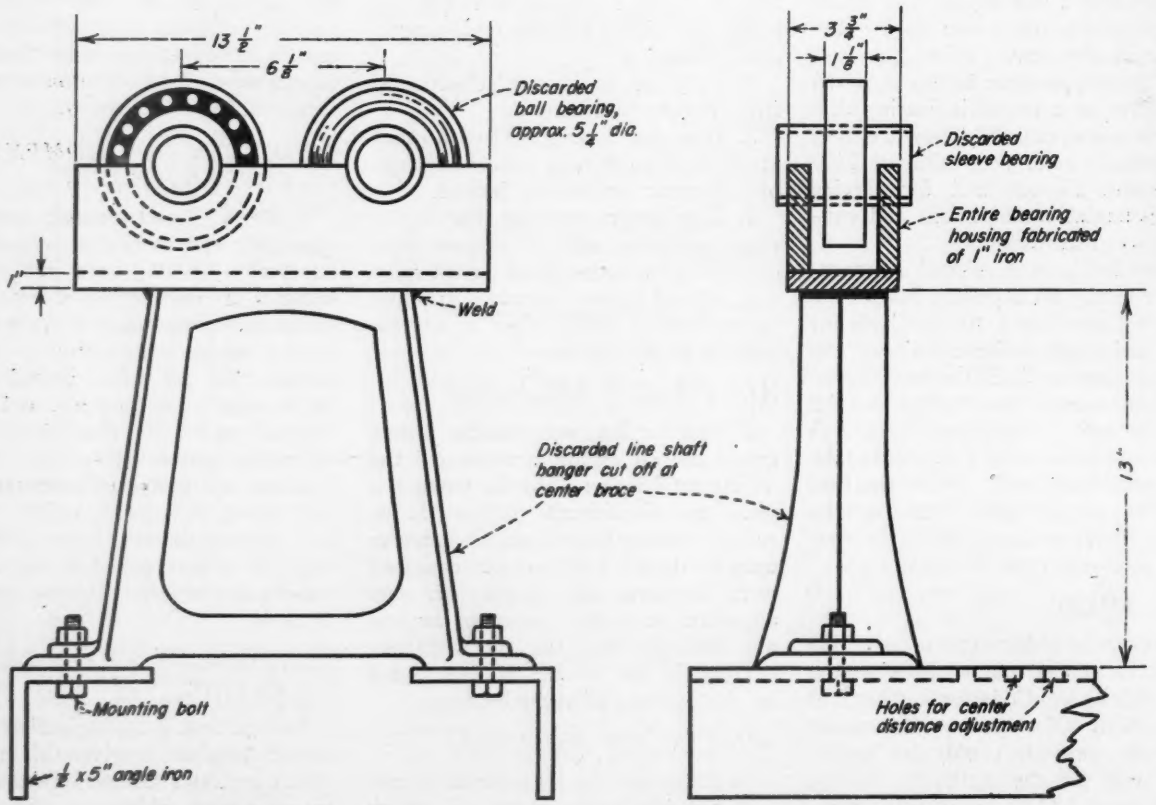
K-10

ROTOR BUCK CONSTRUCTION

(From Scrap Materials)



Rotor in place for banding or repairing



Data from Hagerstown Equipment Co., Hagerstown, Md.—Courtesy 1945 NISA Awards Committee

CENTURY MOTORS

Remarkable Freedom From Vibration Will Help You *Maintain* TOOL ROOM ACCURACY ON PRODUCTION JOBS

3 Century Type S C Squirrel Cage, 3-phase motors

On machine tools of high precision, a Century Motor will help maintain the close tolerances for which the machine was designed. Century motors' smooth operation, with a minimum of vibration means that the driven equipment turns out more accurate production.

Rigid construction, accurately machined feet, permanent alignment, and many other Century features assure top performance during a long motor life, under the toughest operating conditions.

Century motors are built in a wide range of types, in sizes from 1/6 to 400 horsepower to meet the needs of practically every electric power application. They are furnished with open, protected, splashproof, explosion proof or totally enclosed fan cooled frames to meet the requirements of any surrounding atmosphere.

Specify Century motors on all your electrically powered equipment. They are engineered to the functional characteristics of the job to assure top performance.

Century C MOTORS

CENTURY ELECTRIC COMPANY

1806 Pine Street · Saint Louis 3, Missouri

Offices and Stock Points in Principal Cities

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay $5.00.

Reader's Quiz

Discharging A Storage Battery

QUESTION 229—Why is it that a storage battery will discharge itself more quickly while setting on concrete than on a wood support? Hydrometer readings were taken after recharging that were approximately the same; but after a lapse of several hours those in contact with the concrete showed a lower reading. There was no load connected and all the batteries were in A-1 condition.—S.M.K.

A. TO QUESTION 229—If the batteries are in A-1 condition and there is no load connected the difference in the hydrometer readings probably is not due to discharge but, instead, probably due to the difference in temperature of the electrolytes. The electrolytes of both batteries are heated during the charging period and, if the concrete on which one battery is placed is cold, it will cool more rapidly.

The effect of temperature on the electrolyte is such that for each 30° above 77° F., 10 points must be added to the hydrometer reading. At 107° F. with the hydrometer reading of 1.270 the correction of 10 points gives 1.280 as the true gravity reading. At 77° F. the hydrometer reading is correct whereas at 47°, 10 points must be subtracted.

Therefore, the effect of temperature on the hydrometer readings may account for the difference obtained on the batteries resting on wood or concrete supports, and the change is not caused by discharge.—J.C.L.

A. TO QUESTION 229—Lower specific gravity readings of electrolyte in storage batteries can be ascribed to any one of the following conditions.

Buckling of plates, sediment in the bottom of the container, change in temperature of the electrolyte and impurities in the electrolyte.

The first two conditions would normally be found in old batteries or batteries which had been charged at too high a rate causing overheating.

Raising the temperature of the electrolyte would also cause the lowering of the specific gravity.

Impurities in the electrolyte causes local action within the battery, discharges the plates which in turn lowers the specific gravity reading.

I interpret the question to mean that several batteries were set on concrete and several on wood supports.

If two batteries only were involved, the findings of SMK would not be conclusive unless the batteries were recharged and locations reversed. In that case if the battery on concrete, after several hours, was found to have lower specific gravity it would indicate that the location had something to do with the results but if the same battery was lower in sp. gr., it would indicate internal trouble caused by one of the conditions first mentioned.

In the case in question, if several batteries in good condition were placed in each location with the results described, the batteries on the wood support would naturally cool faster and cause a higher sp. gr. reading due to better ventilation around the batteries.

This, however, does not mean that the batteries on concrete have discharged to a greater degree than the ones on wood, but does mean that there is a temperature difference in electrolyte. Neither does it contradict the fact that batteries work better in warm weather than in cold, because in warm weather the pores in the active material are expanded and allow greater surface contact between active material and electrolyte.—B.A.S.

A. TO QUESTION 229—The reason is that concrete is a better heat conductor than wood. The concrete collects cold, and transfers it to the battery. Warm air touching the insulation between battery terminals causes condensation, which combined with spilled ordinarily dry acid caused the current to flow, which reduced the reading.—H.S.

A. TO QUESTION 229—A storage battery without load will not discharge more rapidly because it is sitting on any particular surface. However, some surfaces will conduct heat into or away from a battery more rapidly than others, causing a difference in specific gravity. This, of course, will give different hydrometer readings even though the electrolytes are identical except for temperature. If your hydrometer readings are corrected for temperature, they should remain the same after several hours if they were the same (corrected for temperature) immediately after charge, as charging raises the temperature of the batteries.—C.J.H.

Direct Current Generators

QUESTION 230—If the brush gear setting has been lost on a direct current generator after dismantling, what is the proper procedure to restore correct setting of brush gear to this generator which has a four coil field? Also, what is an easy way to determine which has the positive lead from the negative lead?—R.M.H.

A. TO QUESTION 230—The most accurate method of locating the brush position is with a millivoltmeter or a voltmeter. To use a millivoltmeter, connect its leads to two segments one pole space apart and as nearly as can be judged, located in the neutral zone. Then connect the field coils to the line and after a short time open the switch again. This will cause a low voltage to be induced in the armature whose effective value at the neutral is zero. There-

Wagner "ALL-IN-ONE"

The Modern UNIT SUBSTATION

SIMPLIFIES THE PLANNING, PURCHASE, and INSTALLATION of POWER DISTRIBUTION EQUIPMENT

This one unit comprises a complete substation with air-cooled transformer, H. V. disconnect switch and L. V. circuit breakers—all compactly arranged in an attractive steel cabinet.

Engineered as a single unit, ready to connect to the line, this modern substation provides several important money-saving advantages in the distribution of electric power in factories, office buildings, hospitals, department stores, schools, etc. You save on first cost because no extra engineering and less labor costs are involved. You save on installation cost because the ALL-IN-ONE substation is delivered as a complete, easy-to-handle unit, ready to connect to the line. Neither fireproof vault nor safety fence is required. You save on maintenance as there is no insulating liquid to test, filter, or change. Panels can be easily removed for quick inspection.

There are no external bushings—no rods, wires, or other exposed live parts to offer a safety hazard. This indoor unit assembly makes a neat, attractive installation anywhere. It can be placed at load centers to shorten low-voltage feeder lines, thus effecting a substantial saving of copper, and at the same time improving voltage regulation of lighting and power circuits.

The ALL-IN-ONE substation is furnished in sizes 100 to 300 kva, 60 cycles, with several combinations of H. V. and L. V. ratings. For sizes above 300 kva Wagner Multumite Unit Substations offer substantially the same money-saving, time-saving advantages as the smaller ALL-IN-ONE substations.

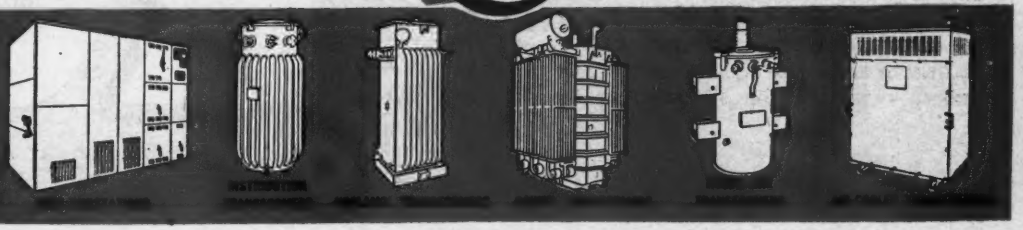
For more information on Wagner ALL-IN-ONE substations and Wagner Multumite unit substations write today, addressing your request to Wagner Electric Corporation, 6413 Plymouth Avenue, St. Louis 14, Missouri. T46-24

Consult Wagner Engineers on all Transformer Problems

Sales and Service Branches: Atlanta 3 • Baltimore 18 Boston 15 • Buffalo 8 • Chicago 16 • Cincinnati 10 Cleveland 15 • Dallas 1 Denver 2 • Detroit 2 • Houston 2 • Indianapolis 4 Kansas City 8 • Los Angeles 15 • Memphis 3 • Milwaukee 2 • Minneapolis 4 • New York 7 • Omaha 2 • Philadelphia 8 • Pittsburgh 13 Portland 9 • St. Louis 3 • Salt Lake City 1 • San Francisco 3 Seattle 4 • Syracuse 2 • Tulsa 3 • Washington D. C. 5
In Canada: Wagner Electric at Leaside, Ontario

Wagner LOCKHEED HYDRAULIC BRAKE PARTS and FLUID...NoRoL...CoMaX BRAKE LINING

WE **Electric** AIR BRAKES...TACHOGRAPHS...INDUSTRIAL BRAKES...ELECTRIC MOTORS...TRANSFORMERS



Don't stunt

PACEMAKER IN WIRE PRODUCTS

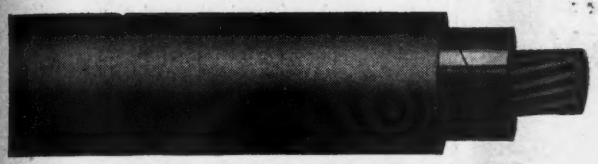
WEATHERPROOF WIRE • SERVICE ENTRANCE CABLES • RUBBER AND PLASTIC COVERED WIRES AND CABLES (INCLUDING SMALL DIAMETER INSULATED BUILDING WIRES) • RUBBER SHEATHED PORTABLE CABLES • RUBBER INSULATED POWER CABLES • TELEPHONE WIRES MAGNET WIRE • PIGTAIL AND BRAIDED COPPER • BARE COPPER STRAND • TROLLEY WIRE • VARNISHED CAMBRIC POWER CABLES

ROE

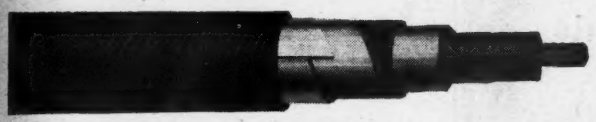
ELECTRICAL

YOUR POWER SYSTEM'S GROWTH

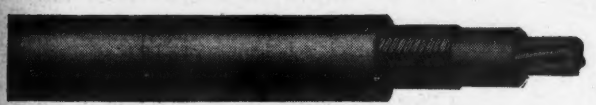
Wire adequately now . . . with correct **ROEBLING** *cables*



VARNISHED CAMBRIC INSULATED CABLE for power, heat or lighting circuits.



PARKWAY CABLE for general power supply and distribution circuits.



RUBBER INSULATED POWER CABLE for general power and lighting purposes.

SMALL DIAMETER BUILDING WIRE for use on new or rewiring installations.

How much an industrial plant can grow depends largely on its power system. Wiring that doesn't provide for expanded production can straitjacket profits, tomorrow. And it can be costly *today* too . . . in terms of excessive voltage drop, losses in power, lowered efficiency.

Adequate Wiring calls for enough circuits, and conductors large enough, to shoulder the big loads now, and the bigger loads to come. Now—before production shoots up to higher levels—is the time to prepare for it.

Roebling electrical wires and cables can be specified with confidence in your Adequate Wiring program. From tough, protective jackets down to copper conductors drawn in Roebling's own mill, they're of top quality materials through and through. Into their manufacture go research and engineering of a high order.

And Roebling field engineers, experienced and reliable, can give you sound, helpful advice in correct cable selection—whatever the purpose, whatever the problem. They'll gladly go to work with you . . . to make *your* Adequate Wiring better than average. Just call our nearest branch office.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities

BLING

JR ROEBLING

WIRES AND CABLES

TYPE RLJFJ
Three Conductor

•

Also all standard types of metallic Parkway cables, to I. P. C. E. A. specs. Special cables to customer's specifications.

NO other protection required except at points of extreme mechanical hazard. Being well protected from ordinary mechanical injury and easy to install, they provide an economical, permanent underground system.

These cables are widely used for street lighting circuits, railroad yard lighting and signal systems, airport power and lighting circuits and in industrial plants and mines.

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

CRESCENT WIRE & CABLE

fore, the millivoltmeter's reading will be zero if connected to two segments that are in the neutral zone and one pole space apart. This is due to the voltage induced in the armature, by transformer action when the field coils are excited or made dead, being shifted 90 electrical degrees from that obtained by revolving the armature in the field of the polepiece. When the armature is revolved the neutral is between the polepieces and is the point of maximum voltage at no load. When a voltage is induced in the armature winding by making and breaking the field circuit, maximum voltage is obtained when measured at a point between adjacent poles, which is the mechanical neutral of the machine and where the brushes should be located.

It will be found that the neutral shifts slightly for different positions of the armature, which is due to the relative position of the armature slots and the poles. The two extreme neutral positions should be located and the center of the brushes located midway between.—F.H.S.

A. TO QUESTION 230—The position of the brushes on a direct-current machine should be on or near the no-load neutral point of the commutator. This neutral point on most standard, non-commutating pole-machines is in line with the center of the pole, and the brushes should be set with a slight lead from this neutral point. The brushes of a non-commutating-pole generator (as was mentioned) should be given a slight "forward lead" in the direction of rotation of the armature. The exact position is that which gives the best commutation at normal voltage for all loads. The brushes should never be set far enough from neutral point to cause dangerous sparking at no load.

The polarity of your leads can be checked with a polarity marked voltmeter.—R.D.R.

A. TO QUESTION 230—To find the brush position of a multipole generator the quickest and easiest method is to place any armature coil under the exact center of an interpole and trace one of the leads from this coil to the commutator segment that it connects. The center of this segment should be at the exact center of the brush.

If the d-c generator does not have interpoles the voltage drop method may be used. Connect a pair of flexible leads to a low reading voltmeter and touch these leads to adjacent commutator bars while the generator is operating at normal load. The neutral plane or brush position is at the point on the commutator where no

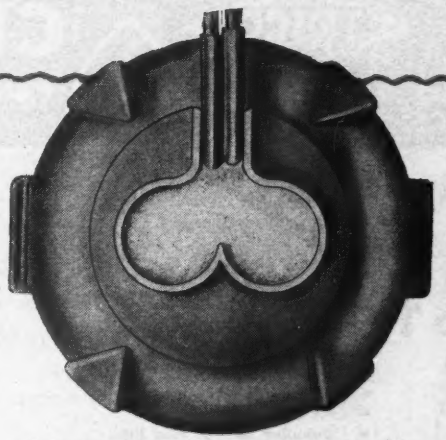
Fibron #5373
flexible plastic tubing

Here is another application where this improved Irvington formulation . . . Fibron #5373 . . . solves an electrical insulation problem involving high temperatures. Hot cement, used to seal the #5373-covered heating elements, has no effect on the flexibility of this unusual plastic. When the heater is in use, the tubing withstands continuous operating temperatures as high as 85° C. #5373 possesses the electrical, mechanical, and chemical properties which distinguish all Fibron tubings. Some of these are:

Dielectric Strength (.020" wall) wet..1000 V.P.M.
dry..1000 V.P.M.
Tensile Strength, P. S. I. 3000
Life at 105° C. .....2000 hours

Fibron #5373 tubing is available in all standard B & S wire gauge sizes, in six brilliant colors, in heavy wall thicknesses if required—in 36" lengths, coils, or cut pieces.

Test this unusual product now. Generous samples and additional technical information gladly sent on request.



**Approved by Underwriters' Laboratories for this application*

Short lengths of Fibron #5373 are used to protect the conductor leads on the heating element of the Electra-Serve, manufactured by Electrical Industries, Inc., Newark, N. J. This bottom view of the unit shows where the hot cement seals over the #5373 insulation. Withstanding this heat and high operating temperatures, #5373 tubing retains its flexibility and high dielectric strength.

IRVINGTON *Varnish and Insulator Company* **IRVINGTON 11, NEW JERSEY, U.S.A.**

Authorized distributors in: BALTIMORE · BLUEFIELD, W. VA. · BOSTON · CHARLOTTE · CHICAGO · CLEVELAND · DALLAS · DENVER · LOS ANGELES · MINNEAPOLIS NEW HARTFORD, N. Y. · NEW YORK · NEW ORLEANS · PHILADELPHIA · PITTSBURGH · ST. LOUIS · SAN FRANCISCO · SEATTLE · HAMILTON, ONT., CANADA

OPPORTUNITY

to make REAL *money*

Electric Motor Distributors everywhere prefer to stock and sell Johnson ELECTRIC MOTOR BEARINGS because the line is complete . . . it's top quality . . . it's *profitable.* Why not secure the franchise for your territory? Write today. Johnson Bronze Company, 490 South Mill Street, New Castle, Pennsylvania.

Write for DETAILS

TRICO

KLIPLOK CLAMPS FOR FUSE CLIPS

STOP . . .

- Premature fuse blowings.
- Burnt fuses and clips.
- Unnecessary shutdowns.
- Lost production.
- "Doubling up" of fuse links.
- Arcing and heating at contacts.
- Wasted current.
- Fire and accident hazards.

SAVE FUSES — CLIPS — POWER!

TRICO KLIPLOK CLAMPS supply the needed pressure for easy flow of current. Prevents unnecessary shutdowns, damaged equipment and wasted power. Hundreds of thousands in use. There's a size for every clip.
Production and safety engineers insist upon KLIPLOKS for performance and safety. Easily and quickly installed! No effort—no tools—no danger!

TEST CLAMPS

These sturdy clamps carry heavy currents and "stay put" when attached. Used for temporary connections, motor and meter testing, jumpers, etc.

INSTALL KLIPLOK CLAMPS TODAY!

Write for Bulletin No. 6

TRICO FUSE MFG. CO. Milwaukee 12, Wis.
In Canada—IRVING SMITH LIMITED—Montreal

voltage is indicated in the meter. A steady hand is needed for a test of this kind, otherwise the readings are not accurate or meter may be damaged.

An easy and cheap way to determine which is the positive lead or negative lead, is to connect two No. 12 or No. 10 solid wires to the brush leads. Clean the two free ends about one inch back and place them in a glass vessel containing a solution of water into which may be poured some common salt, or blue stone. When current flows through the circuit hydrogen bubbles will form at the conductor that connects with the negative pole or side of the circuit. Be careful of the bare ends and not let them touch together and cause a short circuit.—H.W.

A. TO QUESTION 230—In determining the brush gear setting an a d-c generator without interpoles, the proper procedure is to determine the neutral point on the commutator and then advance the brush gear slightly in the direction of rotation until best commutation is obtained at normal voltage and on all loads. In interpole generators, the brushes are set at the exact neutral point.

One of the most accurate ways of locating the electrical neutral is the kick method. The test is based on the theory that with the armature at standstill, maximum voltage is induced in armature wires located under the center of two adjacent poles and no voltage is induced at points equidistant from two adjacent poles. The latter are the neutral points where the brushes should be set. Inasmuch as the point of maximum voltage generation by the kick method is 90 electrical degrees apart from the point of maximum voltage generation by revolving the armature in the field of its polepieces, maximum voltage generated by revolving the armature occurs at the neutral point.

While the generator is at standstill, the test prongs of a low reading voltmeter are inserted centrally down through two wooden blocks fitted snugly into the brushholders. With the shunt field excited to about half its normal strength, voltage is induced in the armature wires by making and breaking the field circuit. The position of the brush gear at which the interruption of field current fails to produce any deflection on the voltmeter determines the neutral point. In the four-pole generator in question, the average of the positions of neutral for each pair of brushholders should be taken as the correct setting for the brush gear.

The location of the exact neutral point is also somewhat affected by the relative position of armature slots

DO BETTER WORK WITH THE BEST MATERIALS...

ESSEX WIRE... *There Is No Better Made!*

Essex makes the kind of wire every shop wants and needs — soft *MAGNET WIRE* with tough, high quality insulation — formvar, enamel or fabric — and PB300 *LEAD WIRE* — *the* lead wire for motor repair shops — flexible and easy to use.

Made to stand up under your baking varnish treatment without harm — incorporating every latest technical development to improve both wire and insulation—*ESSEX WIRE* meets the toughest requirements for top quality and service.

Shipment can be made from warehouse or factory stocks.

Send for Complete List and Prices

VARTEX CLOTH AND TAPE

. . . The Peak of Quality!

Dependable — low in cost — *VARTEX VARNISHED CLOTHS AND TAPES* insure all your repair jobs against failures and protect you against comebacks and customer dissatisfaction.

VARTEX gives you all these qualities — easy-working flexibility at any temperature — great mechanical strength — high dielectric properties — and maximum resistance against oil, grease, acid. alkali, moisture, heat and abrasion.

VARTEX is made only from the strongest long-staple cotton — the finest insulating varnish — under rigid scientific manufacturing controls — to insure perfect uniformity and the highest quality. *VARTEX* is the cheapest insurance you can buy on your time and work. The sizes and thicknesses you need are carried in stock for immediate delivery.

Write Today for Samples and Prices

U-WEDJ * FIBRE ARMATURE WEDGES

. . . With the Perfect Shape!

IWI "U" Shaped Fibre Slot Wedges — *U-Wedjes* — give you the best possible protection against electrical and mechanical troubles and failures.

Formed to fit the motor slot perfectly, *U-Wedjes* protect and hold windings firmly in place — won't turn over in the slot — slip over both sides of the slot cell insulation — and permit windings to be placed closer to the top of the slot.

U-Wedjes are made of the finest fish paper — are easy to handle and use — come in standard 48" lengths or 250 ft. bundles — and do a swell all-round job! Try *U-Wedjes!*

Write for Free Sample Set, Mounted, Ready to Use

*Trade Mark Reg. U. S. Pat. Off.

INSULATION AND WIRES INCORPORATED

2127 PINE ST. • ST. LOUIS 3, MISSOURI

BOSTON 20, MASS. DETROIT 2, MICH. ATLANTA 3, GA.
HOUSTON 2, TEX. NEW YORK 7, N. Y.

Send for Your Copy of the IWI Blue Catalog.

DEPEND ON—INSIST ON—

P. R. MALLORY & CO. Inc.

MALLORY CAPACITORS

Necessary leads, lugs, screws, and nuts are included in each box for any type connectors.

Mallory MSG Capacitor:—Small, compact AC Motor Starting Capacitor that fits almost every mounting bracket or box. Replaces rectangular capacitors with leads, lugs or studs. Each capacitor is packed with complete set of universal mounting hardware and installation instructions.

Distributed by

INSULATION AND WIRES INCORPORATED
SAINT LOUIS 3, MISSOURI
BOSTON 20, MASS. · DETROIT 2, MICH. · ATLANTA 3, GA.
HOUSTON 2, TEX. · BLUEFIELD, W. VA. · NEW YORK 7, N. Y.

SITTLER COMPANY
CHICAGO 7, ILL.

H. A. HOLDEN, INC.
MINNEAPOLIS 3, MINN.

TRI-STATE SUPPLY CORPORATION
LOS ANGELES 13, CAL. • SAN FRANCISCO 7, CAL. • SEATTLE 4, WASH.

E·M·T CONNECTIONS IN A FEW SECONDS!

With B. M. Fittings

TWO QUICK SQUEEZES give you Finer, Faster Conduit Connections. B-M Fittings do away with the twisting, turning and tightening of nuts and save you valuable time and materials. Then too, they are stronger, neater and much easier to work with in tight places. Start using B-M Fittings today. Have more satisfied customers—more profits from each job!

(All B-M Fittings carry the Underwriters Seal of Approval)

DISTRIBUTED BY

The M. B. Austin Co., Chicago, Ill.
Clayton Mark & Co., Evanston, Ill.
Clifton Conduit Co., Jersey Cy., N. J.
Gen. Electric Co., Bridgeport, Conn.
The Steelduct Co., Youngstown, Ohio
Enameled Metals, Pittsburgh, Penn.
National Enameling & Mfg. Co., Pittsburgh, Pa.
Triangle Conduit & Cable Co., New Brunswick, N. J.

BM SYSTEM

BRIEGEL METHOD TOOL CO. • Galva, Ill.

and polepieces. The possible undesirable effects of high voltages induced in the field coils in making and breaking the field circuit may be minimized by opening the field switch slowly.

The positive and negative terminals of the generator in operation may be identified by testing with a d-c voltmeter. If the voltmeter indicates upscale, the marked positive lead of the voltmeter points out the positive terminal of the generator. When a voltmeter is not available, the bubbling of one of two wires immersed in a salt solution will identify the negative terminal.—R.G.C.

Correcting Power Factor

QUESTION 231—Can any reader tell me the formula for figuring the size capacitor in microfarads for correcting the power factor of low power factor ballasts in fluorescent light circuits; one, two, or three light ballasts?

For example, I have a store with four single tube fluorescent lamps with four ballasts wired on one switch. They are low power factor ballasts, I assume about 55 percent. How can I correct to 90 percent?—O.A.T.

A. TO QUESTION 231 — By theoretical procedures to determine the size of the capacitor used to correct the power factor of low power factor fluorescent ballast circuits, the following equations can be evolved:

Microfarads needed to correct from 55 to 90%

$$= \frac{1510 \times \text{line current}}{\text{circuit voltage}}$$

Microfarads needed to correct from 60 to 90%

$$= \frac{1350 \times \text{line current}}{\text{circuit voltage}}$$

In practice it is customary to determine the capacitor size from data published by capacitor manufacturers as follows:

Lamp Size	Circuit Voltage	Microfarads Needed Per Lamp for 90% P.F.
15-watt T-8	118	4.2
15-watt T-12	118	5.2
20-watt T-12	118	4.7
30-watt T-8	118	8.5
30-watt T-8	208	2.6
40-watt T-12	118	8.7
40-watt T-12	236	2.6

The circuit illustrated with the question showed four lamps taking 1.54 amperes line current and 100 watts at 55 percent power factor. Using the formula, about 20 microfarads would be needed. Using the table above, four 20-watt lamps would call for 4.7 times 4 or about 19 microfarads. Standard capacitors for this service come in sizes of 4-¾, 12 and 18 microfarads, so a

Lets take a LOOK at the inside of a WARE HI-LAG Renewable FUSE

Double Fibre Bridge Assembly increases strength 10 times Maintains perfect alignment.

Only one wrench needed to remove blown link and renew.

Rugged simplicity. Only 3 parts to handle in renewing link.

GAS VENT HOLES AT BOTH ENDS

HI-LAG Link of one piece, uniform thickness, has large contact areas—wide body areas to insure dependable absorption of heat for time lag.

Arched spring tension washers and heavy studded bolt, keeps links permanently tight. Reducing excessive heat and needless blows.

WARE HI-LAG FUSES have many exclusive features in design and construction which make them far superior in operation—much more economical in rendering longer fuse life and with unsurpassed safety insurance.

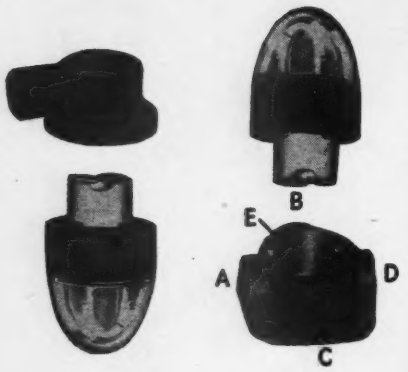
Try WARE HI-LAG FUSES NOW! Start enjoying uninterrupted production progress and new fuse economy with the World's Best and Coolest Operating Renewable Fuse.

Write for Brochure giving details of all the COOL FACTS, sizes and prices.

APPROVED BY UNDERWRITERS' LABORATORIES

WARE Brothers 4450 W. LAKE ST.·· CHICAGO 24, ILL.

Midget Vaportight Lighting Fixtures



These Midget fixtures are ideal for use on control panels, for elevator signals, as signal and warning lights for welding machines and similar equipment, wherever vaportight protection is needed. Fixture body diameter is 2 11/32" and may be used with Midget Pylets as shown, tapped as specified, or without Pylet body for panel mounting. Fixture takes 10 watt S-11 intermediate screw base lamps and can be furnished with clear, frosted, ruby or green globe.

Consult your Pylet Catalog for complete listings.

THE PYLE-NATIONAL COMPANY
1344 N. Kostner Avenue, Chicago 51, Illinois

single 18-microfarad capacitor would bring the circuit almost to 90 percent power factor.—C.L.A.

A. TO QUESTION 231—The calculation for power factor correction is rather involved, but for the specific general problem of the correction of low power factor fluorescent lamp ballasts, of which the data in the problem is typical, the simplest formula for the practical man is to take the wattage and multiply it by the factor 0.2. This will give the capacity required in mf. to correct the power factor from 55% to 90%.

In other words, for O.A.T.'s problem, the mf. capacity needed is 100 x 0.2 mf. or 20 mf. at 115 volts 60 cycles. The factor of 0.2 is easy to remember.

If the conditions are different, probably the best way to solve the power factor problem is to use one of the standard power factor correction tables which gives the corrective reactive volt amperes required. The mf. capacity necessary for this volt ampere value is given by the following formula:

$$Cmf. = \frac{1{,}000{,}000 \times RVA}{6.28 \times F \times V^2}$$

Where "Cmf" equals Capacity and "RVA" equals Reactive Volt Ampere, as determined from standard table, "F" equals Frequency in cycles per second and "V" equals Voltage in volts.—M.A.H.

Can you ANSWER these QUESTIONS?

QUESTION N-10—In regard to 3 phase stator winding coils, can someone tell me what the difference is between a right hand coil and a left hand coil? If a winding has left hand coils, what effect would there be on a stator's operation if right hand coils were used and vice versa?—E.J.K.

QUESTION P-10—What is an easy way of dynamic balancing of rotating machinery in the field?—H.S.

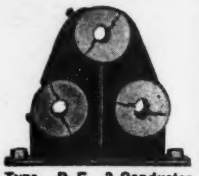
QUESTION Q-10 We have open or bare 110 volt trolley circuits in our plant and I would like to know what method to use to prevent the blowing of fuses on these circuits when a small tool or extension cord is shorted or grounded. Many tools are in use on these circuits fed with a trolley collector.—F.A.B.

PLEASE SEND IN YOUR ANSWERS BY DECEMBER 15

SIMPLICITY PLUS!

New NON-INDUCTIVE CABLE RACK

for INDUSTRIAL PLANT WIRING



Type D-F 3-Conductor Cable Rack. New Non-Inductive Design. Racks available for Cable sizes from 5/16" to 2½".

● Radically different, the new M. & W. Non-Inductive Cable Rack is designed for A.C. or D.C. systems. Racked cables only partially surrounded by metal eliminates any chance of induced current in the rack. Impedance reduced with cables mounted in delta formation. Rack of one-piece construction . . . installation of cables made quick and easy through the use of split bushing.

Send today for Bulletin C-S-51 which illustrates the complete line

THE M. & W. ELECTRIC MANUFACTURING CO., INC.
EAST PALESTINE, OHIO

Get a FIRM GRIP IN HOLLOW MATERIALS

PAINE TOGGLE BOLTS

Paine Spring Wire Toggle Bolts take hold in hollow walls and provide sure, permanent support for hanging or securing fixtures. The two-piece toggle springs into place after insertion and will not pull out or work loose. Available in several head styles in standard bolt diameters from ⅛" to ½" in standard lengths.

SPECIAL TOGGLE BOLT CLAMP — free with every box of Paine Toggle Bolts — cuts installation time in half.

Ask Your Supplier or Write for Catalog
THE PAINE CO.
2961 Carroll Ave., Chicago 12, Illinois
Offices in Principal Cities

★ PAINE ★
FASTENING and HANGING DEVICES

Answered by
F. N. M. SQUIRES and GLENN ROWELL
New York Board of Fire Underwriters
Chief Inspector
New York, N. Y.
Electrical Engineer
Fire Underwriters Inspection Bureau
Minneapolis, Minn.

Questions on the Code

Grounding of Furnace Unit

Q. *Is the usual furnace unit consisting of blower motor etc., usually considered sufficiently grounded when connected to the furnace housing and the wiring ahead of disconnect switch is non-metallic sheathed cable?*—E.S.

A. No. A hot air furnace would not in itself be considered grounded.

Most hot water and steam boilers are grounded by means of the connecting cold water pipes but even at this all unions should be bonded.

The best way would be to run an independent grounding conductor from the motor to the street water main.—F.N.M.S.

Rural Wiring

Q. *The new R.E.A. inspector has been demanding that all services on frame buildings be run on the outside of the wall to a point opposite from the service switch and then directly through the wall into the switch cabinet. Is this a new Code ruling or just his idea?*—R.W.

A. This is not a requirement of the N. E. Code. If you will note the fine print note under Section 2331 you will find that the Code recommends that this procedure be followed unless the service conductors are provided with overcurrent protection outside the combustible building wall. However, there is another condition which must be taken into account in rural or suburban electrical installations and that is the frequency of lightning or other high voltage surges entering service equipment. Experience has definitely indicated that this frequency is sufficient in many areas to warrant the adoption of special rulings concerning service installations. Obviously a fault within a service cable or raceway on the outside of a combustible wall is not as likely to cause a fire as one within the wall, so even though the R.E.A. project on which you are working may not have placed such a wiring requirement in force, it would seem an excellent means of assuring your clients greater safety from fire at no appreciable increase in cost to you.—G.R.

Improper Fixture Supporting

Q. *Here is a recent installation of fluorescent lights on which I would like your comments;*

⅜ inch elevator type cable as stringer, ½ inch conduit, C condulets with covers equipped with cord clamps.

Type of fixture was two light 40 watt with plastic shades. One end of fixture was held up by 4 ft. of chain, the other end by a type of SJ rubber jacketed cord No. 16 which was clamped top and bottom with cord connector.

Is this contrary to Code?—H.F.

A. Yes, this is contrary to the Code in some respects, principally the suspension of one end of fixture by means of the flexible cord which was used as the fixture wire. The fixture wire must not be used to hang the fixture on.

We are assuming that the cable has sufficient strength to hold the fixtures as well as the conduit system.—F.N.M.S.

Underground Service

Q. *We are wiring a building that will require a No. 2 three wire underground service. So far we have been unable to obtain this wire. However, we can get enough No. 6 type TW wire if we could parallel two No. 6 wires in place of single No. 2 wires. Would such an installation be a Code violation?*—G.W.

A. No, this would not be a Code violation provided you consult your Electrical Inspector prior to the installation of this service and obtain his special permission as required by the N. E. Code. Section 3008 was revised by interim amendment No. 39 on November 25, 1941 and reads as follows:

"Conductors in sizes 1/0 to 500,000 C.M., inclusive, may be run in multiple providing they are of the same length, have the same circular-mil area and type of insulation used. Except as provided herein conductors shall be run in multiple only by special permission or as permitted in Section 6205. Where conductors are run in multiple, they shall terminate at both ends in pressure connectors so arranged as to insure equal division of the total current between all conductors that are involved."

In view of existing conditions, one certainly would be justified in requesting this special permission.—G.R.

Demand Factor on Motor Feeder

Q. *I am wondering if there is ever any diversification factor used in figuring distribution feeders for motors. The horsepower of the motors I have in mind is about as follows: There is approximately 28 hp. in small motors, that is, 3 hp. and under, with the majority of this 1½ hp. and under. Added to this are five 7½ hp. motors or 37½ hp. total, plus two 5 hp. motors. These motors will never be on all at the same time. Furthermore, they are somewhat scattered, the farthest being approximately 180 feet away from the first.*

At one time there would likely be three 7½ hp. motors operating, possibly two hp. and maybe 7 or 8 hp. in the small motors. I doubt very much if the load would ever be greater than this.

How to SELL MORE Poultry time switches

Stock the New Paragon PS-30 and "talk" these Unbeaten Features

1 The new PS-30 provides . . . better than any other switch . . . both morning and evening poultry house lighting with dimming period for roosting. Lighting stimulates hormones, increasing egg production without increasing feed consumption . . . when egg prices are highest.

2 The PS-30 provides uniform work day throughout winter and summer . . . plus week-end leisure for owner and family group.

3 Telechron Motored. Lowest priced complete Poultry Time Switch. . . . . $12.75 LIST

Write for sales aids. Paragon designs and manufactures Time Controls for every need

PARAGON ELECTRIC COMPANY
1614 TWELFTH STREET
TWO RIVERS,
WISCONSIN

Paragon Two Rivers WISCONSIN
BUILDERS OF ELECTRICAL EQUIPMENT SINCE 1905

I have been unable to find in the Code where a diversification factor is used. —E.S.S.

A. Section 4316 of the Code states in part:—"Where a reduced heating of the conductors results from . . . all motors not operating at one time, the authority enforcing this Code may grant permission for feeder conductors to be of a capacity less than specified in the Sections 4314 and 4315 . . .".

Of course the inspection authority would have to be assured of the diversity of the load and the maximum demand which would ever be expected. They might also desire to prevent the overloading of the feeders by requiring the use of fuses selected at the allowable carrying capacities of the wires. Proper time lag fuses would assure this.—F.N.M.S.

Fire Pump Control Panel

Q. *We are installing a fire pump control panel in a rather small room where space is limited. The panel is 3 feet wide and 5 feet high and will butt up against the wall on one side. The wall behind the board is plain masonry and includes a pilaster which extends into the room some 5 inches at a point near the accessible end of the panel. Must we have a clearance of 2½ feet between the back of this panel and the pilaster, or may the pilaster be ignored?*—A.D.

A. It is assumed from your question that the voltage involved is less than 600 and more than 150 volts to ground. The answer to your question may be found under Section 3855 where you will note that 2 feet is all that is required. This section is in addition to the rulings found under Section 1111 which specifies a 2½ foot clearance. It is, however, considered advisable to provide a minimum clearance of 3 feet whenever possible to assure safer working conditions.—G.R.

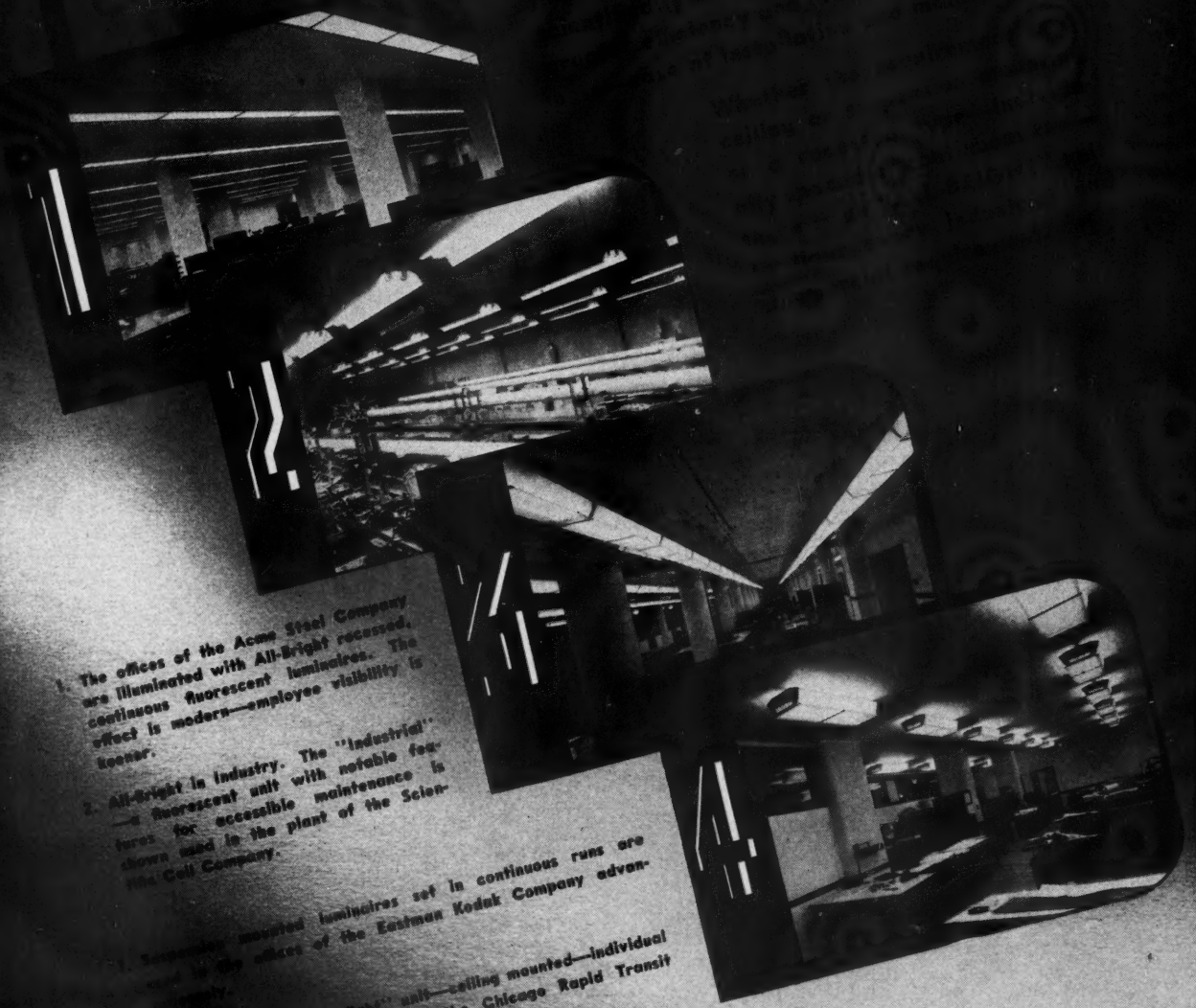
Alcohol Bottling

Q. *Please let me know what type of wiring would be necessary (motor and lighting circuits) in a room where a liquid containing 52 percent alcohol (104 proof), is bottled.*

It is bottled by machine and at no time will there be more than 25 gal-

All-bright

THE RIGHT LIGHT FOR COMMERCE AND INDUSTRY



1. The offices of the Acme Steel Company are illuminated with All-Bright recessed, continuous fluorescent luminaires. The effect is modern—employee visibility is keener.

2. All-Bright in Industry. The "Industrial" —a fluorescent unit with notable features for accessible maintenance is shown used in the plant of the Scientific Coil Company.

3. Surface mounted luminaires set in continuous runs are used in the offices of the Eastman Kodak Company advertising.

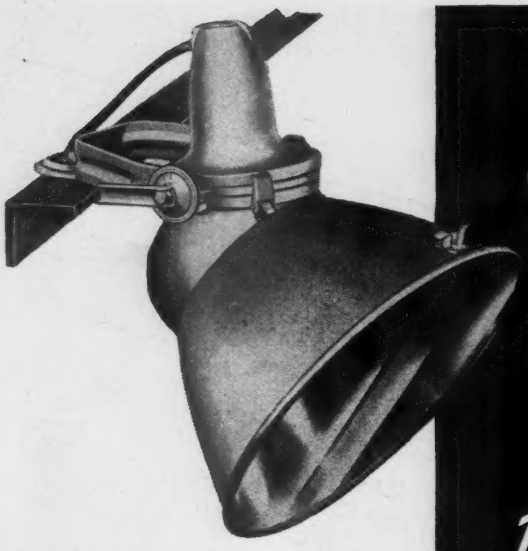
4. The All-Bright "Skylight" unit—ceiling mounted—individual luminaires in the offices of the Chicago Rapid Transit Company.

LIGHT RIGHT WITH ALL-BRIGHT

All-bright ELECTRIC PRODUCTS COMPANY

Manufacturers of Fluorescent Lighting Fixtures

4500 W. Kedzie Ave. Chicago 18, Illinois



Type L-69, sports and area floodlight

Call G-E for FLOODLIGHTS

. . . and get these important advantages

★ Proper types and sizes for all applications

★ High-efficiency, the result of scientific design

★ Long life and low maintenance expense

obtained through sturdy construction

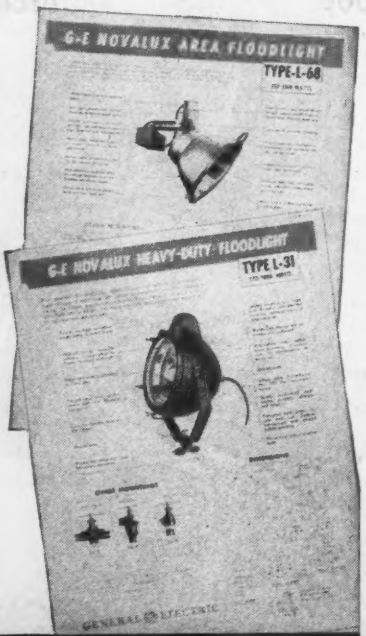
★ Expert assistance with application problems, backed up by 30 years' experience

★ Convenient sales and service facilities

WANT THESE HANDY DESCRIPTIVE LEAFLETS FOR YOUR PROPOSALS?

FLOODLIGHT	PUBLICATION
Heavy-duty, steel casing	
200 or 250 watts, Type L-29	GEA-4303
300 or 500 watts, Type L-30	GEA-4304
750 or 1000 watts, Type L-31	GEA-4305
Heavy-duty, cast aluminum	
1000/1500 watts, Type L-34	GEA-4517
200 or 250 watts, Type L-38	GEA-4325
General purpose, sheet aluminum	
300 or 500 watts, Type L-49	GEA-4311
750 or 1000 watts, Type L-43	GEA-4310
Sports and area, sheet aluminum	
750 to 1500 watts, Type L-68	GEA-4333
750 to 1500 watts, Type L-69	GEA-4590
Area, open porcelain enamel	
300 to 1500 watts Type L-45	GEA-4433
300 to 1500 watts Type L-46	GEA-4434
Handy, sheet aluminum	
100/150 watts, Type L-65	GEA-4516
200 watts, Type L-66	GEA-4346
Underwater, cast bronze	
100/250/400 watts, Type L-33	GEA-4438
500/1000 watts, Type L-39	GEA-4518
500/1000/1500 watts, Type L-41	GEA-4439

Order individually by number, or in sets, from the G-E Apparatus Sales Office or Agent that serves you. Or write General Electric Company, Schenectady 5, N. Y.



GENERAL ELECTRIC

lons in a tank within the room. The room is 60 ft. by 30 ft. and is well ventilated.—G.C.

A. Alcohols have flash points from about 52° to about 11° F. If the liquid being bottled and the surrounding air can be maintained at temperatures below the flash point of the particular alcohol being handled, there will be no evaporation and hence no flammable vapors given off.

The only hazard then would be in case some of the liquid splashed on to a hot lamp bulb or motor which would cause evaporation and a spark would occur and ignite the vapor.

It would be well therefore to have any motor on the bottling machine, as well as any switch or any electric light fixture within the spattering range, of the explosion-proof type.

If a low flash point alcohol is used and the room is at ordinary temperatures, the entire electrical equipment within the room should be of the explosion-proof type.—F.N.M.S.

Cable Installation

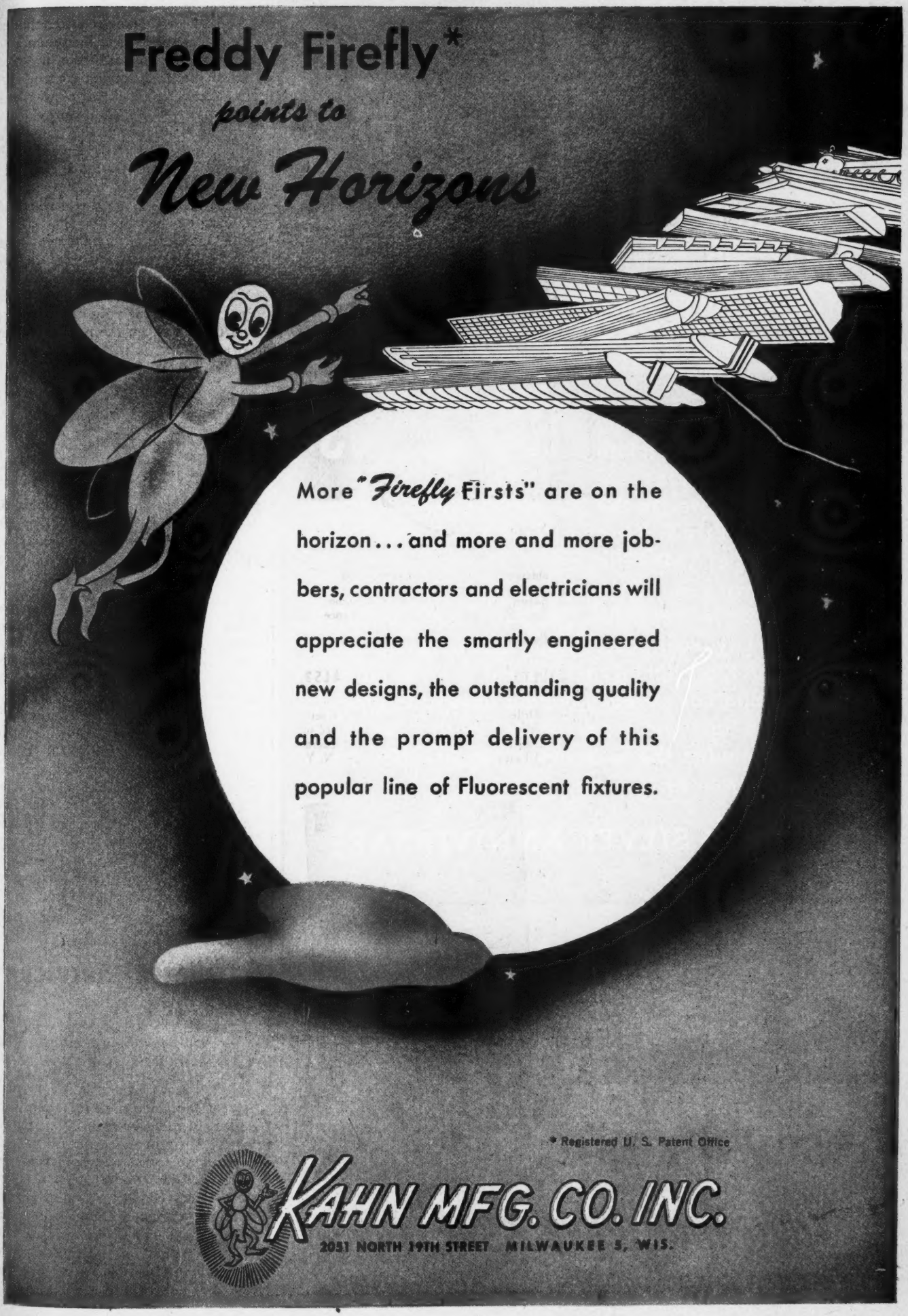
Q. *I have issued a rejection slip on a nonmetallic sheathed cable installation in a masonry warehouse with a wood joist roof because the cable was run at right angle of the joists and fastened to the bottom edge of every other joist. The ceiling height was 14 feet and the contractor claims that the ceiling height is such that there is no danger of the cable being subject to mechanical injury. Will the Code back me in this instance?*—H.H.H.

A. Yes, your decision was proper. Under Section 3364 of the Code is found the requirement that non-metallic sheathed cable must follow closely to the surface of the building finish or of special running boards. If the cable is run at right angles of the joists, it may either be pulled through bored holes or be fastened to a running board. There is no mention made of any exception to this rule because of ceiling height.—G.R.

Limit of Outlets on Circuit

Q. *I would like to know if our latest code book binds up to the number of outlets on a circuit or can we put on as many outlets to safely carry a 15 amp. fuse?*—G.K.

Freddy Firefly* *points to* New Horizons



More "*Firefly* Firsts" are on the horizon... and more and more jobbers, contractors and electricians will appreciate the smartly engineered new designs, the outstanding quality and the prompt delivery of this popular line of Fluorescent fixtures.

* Registered U. S. Patent Office

KAHN MFG. CO. INC.

2031 NORTH 19TH STREET MILWAUKEE 5, WIS.

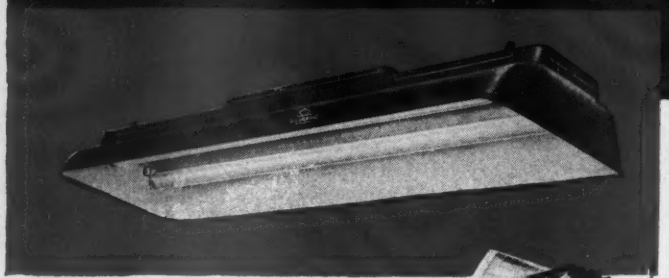
Do You Remember

'way back when your Silv-A-King salesman looked like this? ➡

...and lighting fixtures looked like this!

Frankly, the Silv-A-King lighting units back in those days couldn't hold a candlepower to the efficient Silv-A-King products of 1946. The twenty-five years since Bright Light Reflector Company hung out its shingle have seen some mighty important changes in Silv-A-King lighting equipment. Fact is, 'most everything has changed but our unceasing determination (and we *mean* unceasing!) to make the Silv-A-King line the finest in the industry. Now for another twenty-five years of progress!

1921-1946 SILVER ANNIVERSARY



Home of

SILV-A-KING

Industrial fluorescent Units

BRIGHT LIGHT REFLECTOR COMPANY • Fairfield at State, Bridgeport 5, Conn.

A. The code now requires that not less than a specified number of circuits as computed from the floor area of the building and certain wattage factors per sq. ft., all of which are given in Article 210, be provided in wiring a building. If this number of circuits is equalled or exceeded, the number of outlets on those circuits is not limited.

For loads and occupancies which are not mentioned in Section 2108 a, b, & c, the load is to be computed on an ampere basis as set forth in paragraph 2108d and the number of circuits determined by dividing this load by the rating of the branch circuit to be used. This tends to keep the number of outlets on a circuit to twelve or less—F.N.M.S.

School Lighting

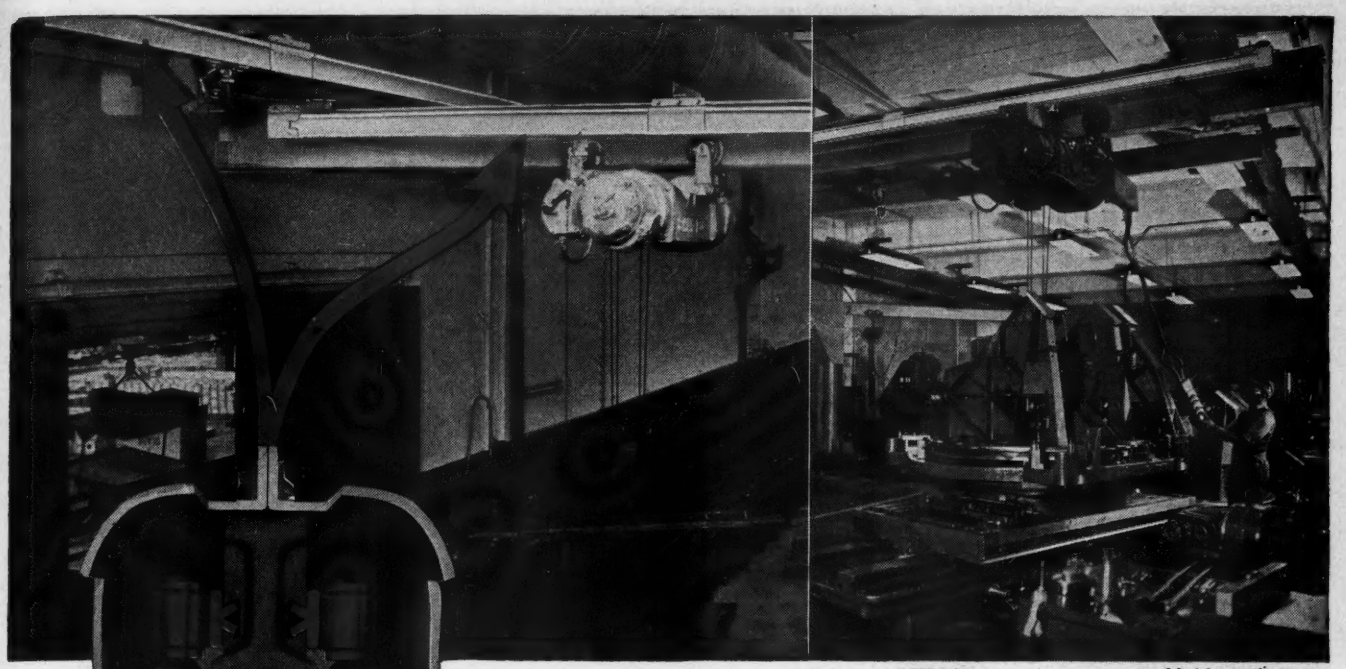
Q. *Would the Code prohibit the use of 465 volt lighting circuits in a school auditorium if the fixtures were hung at least eight feet above the floor?*—R.C.T.

A. Yes, this would be contrary to the N. E. Code as circuit voltages of 465 are limited to industrial establishments only and then when fixtures supplied are at least eight feet above the floor and not controlled by a switch which is an integral part of the fixture. This will not be found in your copy of the 1940 Code as it is an official interpretation issued by the Code Committee about three years ago. Incidentally, the 1946 edition will not change this answer. The standard 15 ampere lighting circuit is limited to 150 volts to ground except in railway properties and industrial establishments.—G.R.

Number of Service Switches

Q. *Does the Code allow more than one main entrance switch?* —R.T.

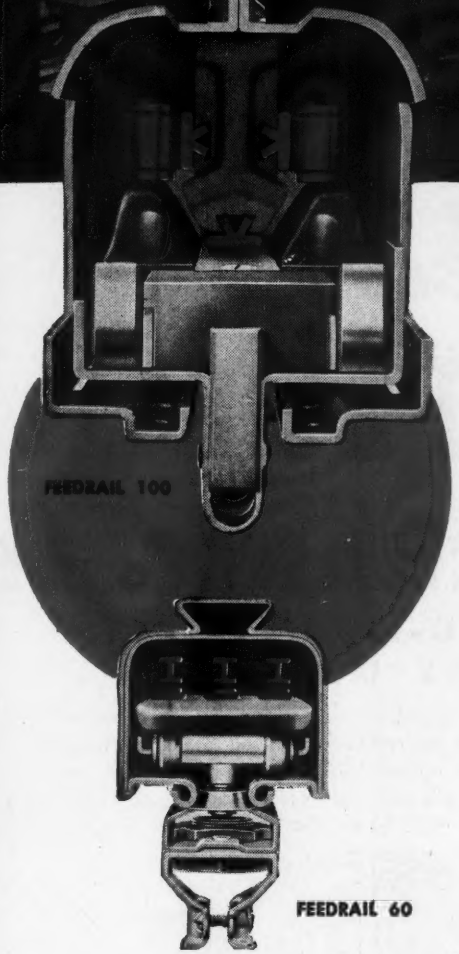
A. The Code used to require that all the current in a building be controlled by one disconnecting means —a single service switch. Now, however, while there can be only one set of service conductors supplying a building (except under certain conditions), there may be up to six service switches. These must be grouped at one readily accessible point. See Section 2351.—F.N.M.S.



FEEDRAIL on main runways and bridges of cranes

MODERNIZE

YOUR CRANES AND HOISTS WITH FEEDRAIL



Exposed trolley wires have no place in a modern plant. In a day's time, you can substitute the enclosed ELECTRIC FEEDRAIL System.

It requires little space, and is furnished in assembled units in stock lengths and curves. Also available for transfers and switches to fit any desired layout.

Feedrail is mechanically strong, electrically foolproof. Trolleys are completely polarized. All electrical parts enclosed, protected against dust — accidental shorts — mechanical injuries.

AND HIGH CYCLE TOOLS

Feedrail is also designed especially for high cycle and portable tools and is used extensively for moving test racks.

Ask for

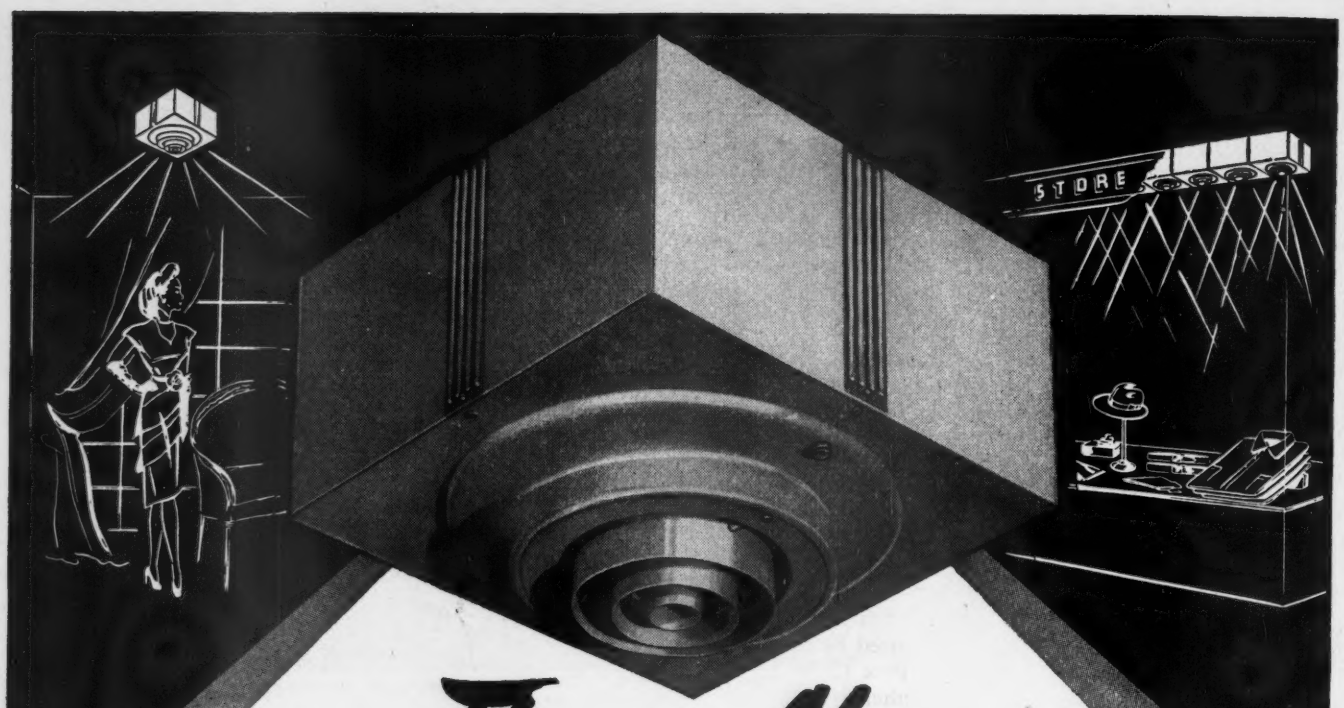
ELECTRIC FEEDRAIL
CATALOGS GENERAL No. 15
NEEDLE TRADES No. 16
MACHINE TOOL No. 17

ELECTRIC FEEDRAIL

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company

125 BARCLAY STREET NEW YORK 7, N. Y.



These New Guth HY-LITERS

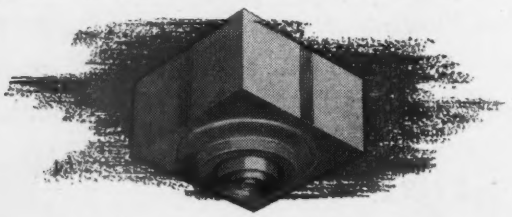
DRAMATIZE MERCHANDISE!

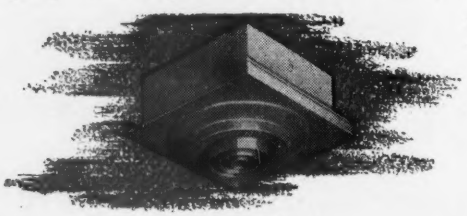
INTENSE SPOT-LIGHT AND FLOOD-LIGHT EFFECTS WORK MIRACLES WITH STORE DISPLAYS!..

GUTH HY-LITERS, using 150-watt Sealed Beam Projector Lamps, provide novel, effective "accent" lighting for stores! HY-LITERS, easily adjustable through a 90° arc for full concentration on merchandise displays or in show windows, bring dramatic emphasis to modern retail merchandising.

HY-LITERS' exterior portions are finished lustrous 300° WHITE Enamel, and surface types are attractively trimmed with polished Aluminum flutings.

They're beautifully fashioned—the last touch in good store lighting. Write today for more details.





Two Types Available for ACCENT Lighting!

HY-LITERS may be had for either Surface or Recessed Mounting. Both types are suitable for use as individual units, or arranged in rows with GUTH FLUORESCENTS. HY-LITERS maintain the high engineering and construction standards of all GUTH Lighting Equipment, and are ideal for today's important ACCENT Lighting.

GUTH HY-LITERS *ARE AVAILABLE NOW!*

THE EDWIN F. GUTH CO. • 2615 WASHINGTON AVE • ST. LOUIS 3, MO.

Guth *Leaders in* LIGHTING SINCE 1902

Modern Lighting

Model Store Features Planned Lighting

A model appliance store has been built by the General Electric Company, Appliance Distributing Branch, in Pittsburgh, Pa. It is a full sized typical dealer's store. Its use is twofold: 1) to display its merchandise to appliance dealers; and 2) to demonstrate maximum effectiveness in store design, layout and merchandise display.

Planned Lighting is the main feature of the display techniques. It consists of general illumination from the new Slimline lamps, localized general illumination for wall displays from hot cathode fluorescent lamps, and "accent" or feature display lighting from adjustable incandescent spotlights. All lighting equipment has been carefully integrated with the store layout and location of displays.

The entire store has been constructed within the company's warehouse. Lighting units and ceiling panels are suspended at nine feet from the floor in the high ceilinged warehouse. A three foot wide canopy extends from the wall at the same height. The ceiling is left open between lighting units and ceiling panels (Fig. 1).

The store front is of all-glass construction, making the whole interior a show window. Twelve 40-watt fluorescent lamps, in a 12-foot long surface mounted louvered metal fixture (Type D) provides general lighting inside the plate glass front. Twelve 300 watt R-40 type lamps (Type E) are installed in the ceiling on universal swivel mountings, which are used to highlight the displays located in the front part of the store.

Inside, general illumination is produced by two continuous rows of fixtures (Type A), one 45 feet long, the other 54 feet long. Each of these continuous row units is made up of eight foot sections of louvered fixture incorporating three 93-inch long Slimline lamps, alternating with individual 300 watt R-40 spotlight lamps (Type B) enclosed in a universal swivel mounting and made a part of the trough. The adjustable spotlights are used to highlight, or "accent" the feature displays.

The general office and the kitchen display area are lighted with flush mounted fluorescent units (Type D). Each unit uses four 40 watt lamps per four foot section, and is equipped with diffusing glass panels.

Merchandise displayed along the

ILLUMINATION VALUES (1)

Light Source Designation	Distance from Wall	Footcandles (2) Horizontal	Footcandles (2) Vertical
Slimline alone	3 ft.	30	19
100 watt fluorescent alone	"	35	6
Reflector spot alone (3)	"	21	11
Slimline and 100 watt fluorescent		60	22
Slimline and reflector spot (3)		50	30
Slimline, 100 watt fluorescent and reflector spot (3)	"	80	34
Slimline alone	6 ft. (4)	41	15
100 watt fluorescent alone	"	26	7
Reflector spot alone (3)	"	70	8
Slimline and 100 watt fluorescent	"	65	22
Slimline and reflector spot (3)	"	112	21
Slimline, 100 watt fluorescent and reflector spot (3)	"	132	29
Slimline alone	10 ft. 2½ in.(5)	36	14
100 watt fluorescent alone	"	9	7
Reflector spot alone (3)	"	27	8
Slimline and 100 watt fluorescent		42	20
Slimline and reflector spot (3)	"	84	21
Slimline, 100 watt fluorescent and reflector spot (3)	"	73	26

(1) After 50 hours' burning
(2) 30 in. above floor
(3) Straight down
(4) Immediately below Slimline — reflector spot luminaire
(5) Centerline of store

Fig. 2.—Above chart, showing illumination values in store, is framed and mounted on wall near switches, enabling dealers to check lighting values from any combination of lighting.

FIG. 1—View of interior of General Electric's Model Appliance Store, Pittsburgh, located in their warehouse. Ceiling is formed by suspended panels and lighting troughs. Each louvered trough section contains three Slimline lamps, and eight-foot sections are divided by built-in spotlights for accenting displays.

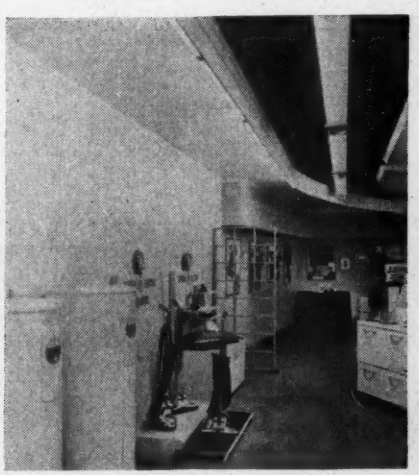
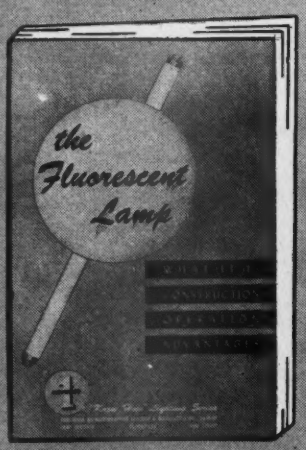


FIG. 3.—Merchandise along sides of room is highlighted by continuous row of 100 watt fluorescent lamps, partially concealed by valance board.

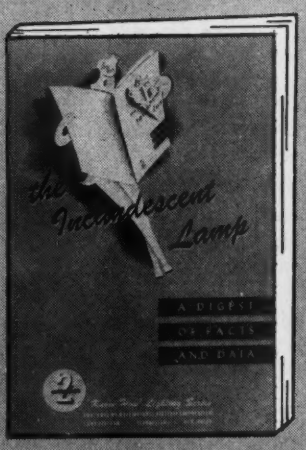
USE THESE Westinghouse

The "know how" lighting series



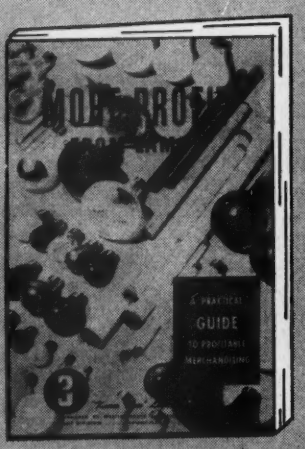
FUNDAMENTALS OF THE FLUORESCENT LAMP

Written in simple language and using many diagrams, this 16-page booklet establishes the background necessary for understanding the efficiency and advantages of using fluorescent light. (Form A-4348)



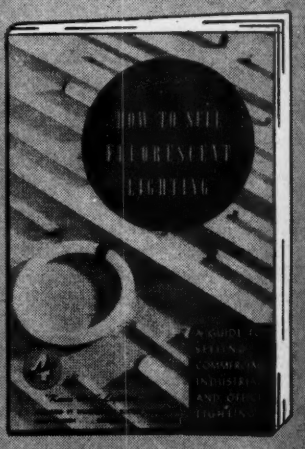
HANDBOOK OF INFORMATION

This 24-page booklet explains how the incandescent lamp works; nomenclature for bulbs, bases, and finishes; characteristics of good lighting; and applications of the right light to various seeing tasks. (Form A-4438)



EFFECTIVE MERCHANDISING IDEAS

Tested techniques which help dealers sell more light are collected and illustrated in this 24-page booklet. Consistent, aggressive promotion of better merchandising sells better lighting and helps build the lighting load. (Form A-4715)



SALES-MAKING ADVANTAGES

Ten advantages of fluorescent light are nailed down in this 24-page booklet. These advantages are then translated into specific "user benefits" for each type of prospect—small shops, department stores, restaurants, offices, industrials, etc. (Form A-4720)

Westinghouse

Plants in 25 cities Offices everywhere

LAMPS FOR SEE-ABILITY

BOOKLETS TO SELL BETTER LIGHTING

The new practical guide to fluorescent lamps

DETAILED INFORMATION

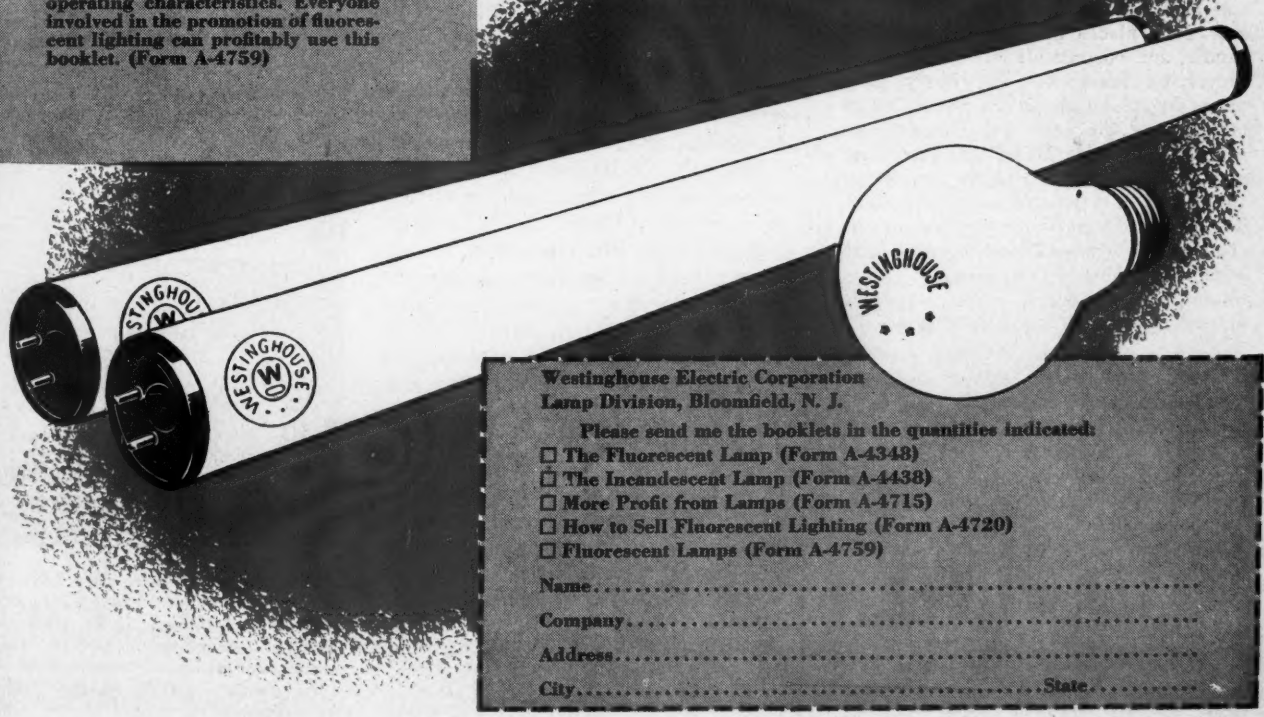
This 24-page booklet clearly presents all the data you need about Westinghouse fluorescent lamps and auxiliary equipment. It includes complete description of the lamps and equipment and gives details of operating characteristics. Everyone involved in the promotion of fluorescent lighting can profitably use this booklet. (Form A-4759)

If you don't already have this helpful literature, send for your copies now

Booklets like these help you sell lighting by explaining to your customers the characteristics, operation, and advantages of modern light sources.

Down-to-earth, simple, and profusely illustrated, they were designed for use by busy people interested in the proper application of light.

REASONABLE QUANTITIES FREE. We will be glad to send you reasonable quantities of any or all of these booklets for your use in promoting lighting sales. There is no charge for the literature. Westinghouse Electric Corporation, Lamp Division, Bloomfield, N.J.



Westinghouse Electric Corporation
Lamp Division, Bloomfield, N. J.

Please send me the booklets in the quantities indicated:

- ☐ The Fluorescent Lamp (Form A-4348)
- ☐ The Incandescent Lamp (Form A-4438)
- ☐ More Profit from Lamps (Form A-4715)
- ☐ How to Sell Fluorescent Lighting (Form A-4720)
- ☐ Fluorescent Lamps (Form A-4759)

Name.....

Company.....

Address.....

City.....State.....

✲ SEALED
✲ SHOCK-PROOF
SAFE

No. 3007

THE NEW
McGILL
Vaporproof

Portable Lamp Guard . . . strong, portable, sealed. It is water-tight, vapor-tight, dust-tight and moisture proof. The plastic handle, and fibre cage are shock proof and non-sparking. A rubber gasket has now been placed between the cage and handle, and absorbs all stress and strain, preventing breakage. The heavy glass protecting globe eliminates possibility of breakage of the lamp bulb inside from splashing liquids. Being air-tight these guards are perfectly safe for use where vapor and dust infused air is prevalent. They have no equal for safety, service and convenience around flour mills, paint booths, finishing rooms, airports, warehouses, food processing plants, shipyards, aboard ships, and many other places.

The No. 3007 has the plastic cage. The No. 3006 has a heavily tinned, electrically welded wire cage.

ELECTRICAL DIVISION

McGILL
MANUFACTURING CO., INC.
VALPARAISO, INDIANA

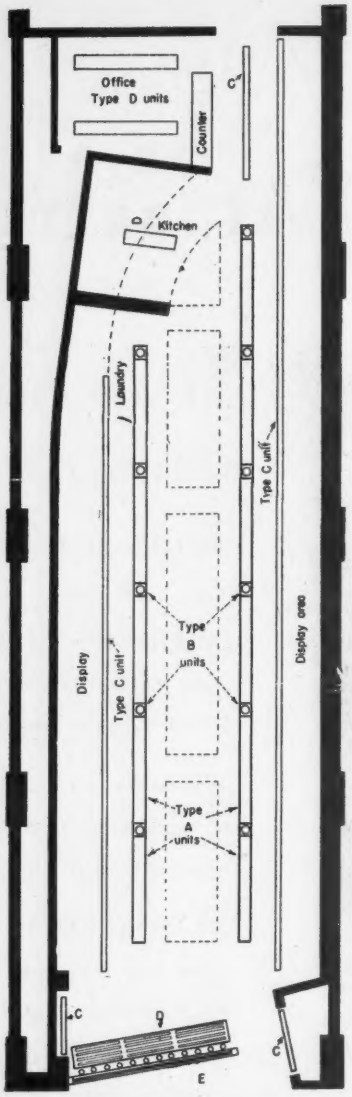


FIG. 4—Floor plan showing lighting layout.

wall area of the store is lighted with a continuous row of 100 watt fluorescent lamps (Type C). These lamps are installed on the ceiling behind a reflector board, and are out three feet on the ceiling from the wall (Fig. 3).

General illumination from the fluorescent lighting alone, and not including intensities from the spotlights, averages over 50 footcandles in this store. All units are separately switched, so that varying intensities and different lighting effects can be demonstrated to dealers. Reading of both horizontal and vertical illumination were taken after 50 hours of use, and a chart made showing these illumination values. This chart is prominently displayed on the wall near the switch panel, for ready reference of dealers who are interested in better lighting for their own stores (Fig. 2).

This lighting was planned by E. D. Altree, formerly with G. E. Lamp Department. All equipment was furnished by Watco Engineering, Inc., Cleveland, Ohio.

Loft Store Combines Light and Decoration

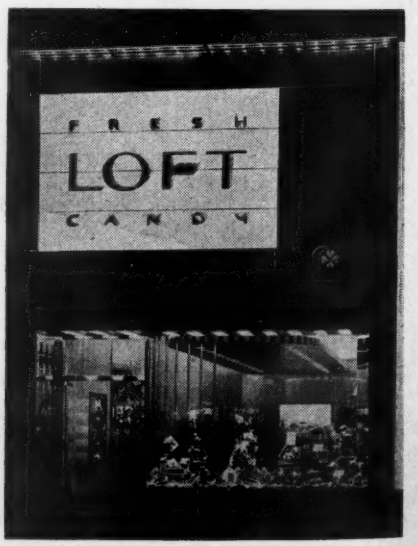
Loft Candy Corporation's new model store on East 42nd Street, New York City, represents its first step in post-war redesign of its chain of 175 stores. Included in the company's program is new packaging, decorating, a new color scheme, and modern store layout.

Recognizing the need for careful analysis and study of this problem, Loft commissioned Charles C. S. Dean, veteran industrial designer of 25 years experience, New York City, to make the study and to submit plans for a complete redesign of the firm's stores and products. His plans, reflected in detail in the new model store, embrace the tying together of store layout, decoration, packaging and product into one unified design.

The result is a gay carnival atmosphere, which retains dignity through judicious use of color, decoration, and harmony in lighting. Thus light and decoration are combined to achieve the desired mood, or atmosphere.

A metal cornice extends across the entire store front. It conceals 60 watt incandescent lamps on 10-inch centers, which highlight the satin finish white etched glass panels forming the "Fresh LOFT Candy" sign, as well as the bright stainless steel structural strips of metal used to hold the Rembrandt blue structural glass front.

Recessed into the ceiling over the show window and entrance are eleven flush panels of light. Each is two feet long and nine inches wide. These panels are lighted alternately with fluorescent and incandescent lamps.



New model store of Loft Candy Corporation, New York City, achieves harmony between light and decoration. Fluorescent and incandescent lamps are carefully combined to provide ideal color quality of light throughout.

From any angle . . .

THE IDEAL REFLECTOR MATERIAL!

This is a specially selected sheet of Alcoa Aluminum. The miracle of it, as far as a lighting man is concerned, is that you can make about any type reflector you want of it. All of them will be about the best of their type you can get.

With the highly efficient Alzak*-finished Aluminum reflecting surface already a part of the metal, it may be bent and shaped without damage to the tough, protective oxide coating. Or the Alzak finish may be put on after you have drawn or spun the sheet.

High efficiency results from such reflectors, for fluorescent, incandescent, or radiant application.

The exterior surface may be polished, or etched, or in iridescent color.

The reflecting surface may be either specular or diffuse.

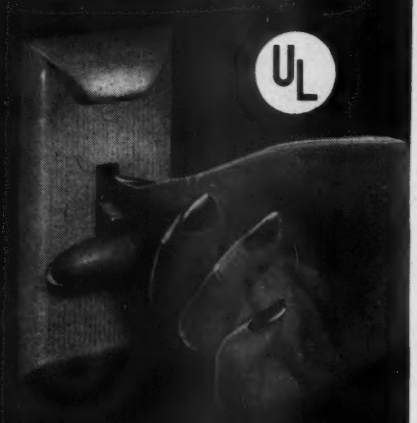
You'll find it more efficient, longer lasting, tougher, less affected by the hazards that reflectors are exposed to, than any reflecting surface you can get. ALUMINUM COMPANY OF AMERICA, 1946 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in principal cities.

*Patented Process

ALCOA ALUMINUM

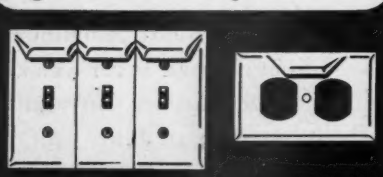
IN EVERY COMMERCIAL FORM

LUMINITE
REG. U. S. PAT. OFF.



Automatic
SWITCH LIGHT
with the
sealed-in neon glow lamp

provides
A nite-lite on every switch . . . a guiding light to every switch



For all single and multi-gang toggle switch panels. Matching units for convenience outlets

—LumiNite lights automatically when you turn room lights off!
—Goes out when room lights are turned on!
—Ends fumbling for switches in the dark!
—Its "safety" glow helps prevent accidents!
—Keeps wall free of smudges from groping hands!
—Shows when you've forgotten to turn off lights remote from switch!
—Operates for less than 2c per year!
—Lasts for years without a burnout!
—Operates on 2, 3 and 4-way switches!
—Listed by Underwriters' Laboratories!
—Adds extra profits to every wiring job! Write for LumiNite details or see your jobber today!

ASSOCIATED PROJECTS CO.
80 E. Long St. • Columbus 15, Ohio
In Canada: LumiNite Products Co., Ltd.
2271 Danforth Ave., Toronto, Ontario, Canada

and fluorescent panels use three 20 watt lamps each. This treatment provides a warm tone of lighting on the window display, and ties in with the coral-rose candy stripe effect on the edge of the canopy inside the store.

Cove lighting blends with direct lighting and with separately lighted wall and display cases inside the store. Suspended over the center portion of the store is a canopy concealing a cove which houses two rows of fluorescent lamps. This cove lighting provides general illumination throughout the store. Recessed flush in the bottom of the canopy are two rows of 6-inch square prismatic glass lenses, which provide direct illumination and sparkle to the various displays. The warm tones of the incandescent blend with the cooler tones of the fluorescent to give an ideal color quality of lighting throughout. Display cases are separately lighted with concealed lamps, causing them to stand out in contrast to their surroundings.

Mr. Dean has successfully unified store design, color and lighting in the decorative treatment of this store. He has proved his adage that the lighting specialist and designer must work closely to achieve unity of purpose in decoration, and a harmonious blend of the lighting as a part of that decoration.

Eggcrate Louvres for U.N. Councils

At the United Nation's Lake Success headquarters the lighting of the two Council Chambers is receiving favorable comment from delegates, press and technicians. Blanketing 70 by 80 foot areas in both chambers, luminous eggcrate ceilings transmit an average of 55 footcandles to the discussion tables and tiered seats. Six miles of 6 inch aluminum stripping was required to construct the 11,000 square feet of louvres and 6200 feet of fluorescent lamps are mounted between these louvred sections and the suspended acoustical ceiling.

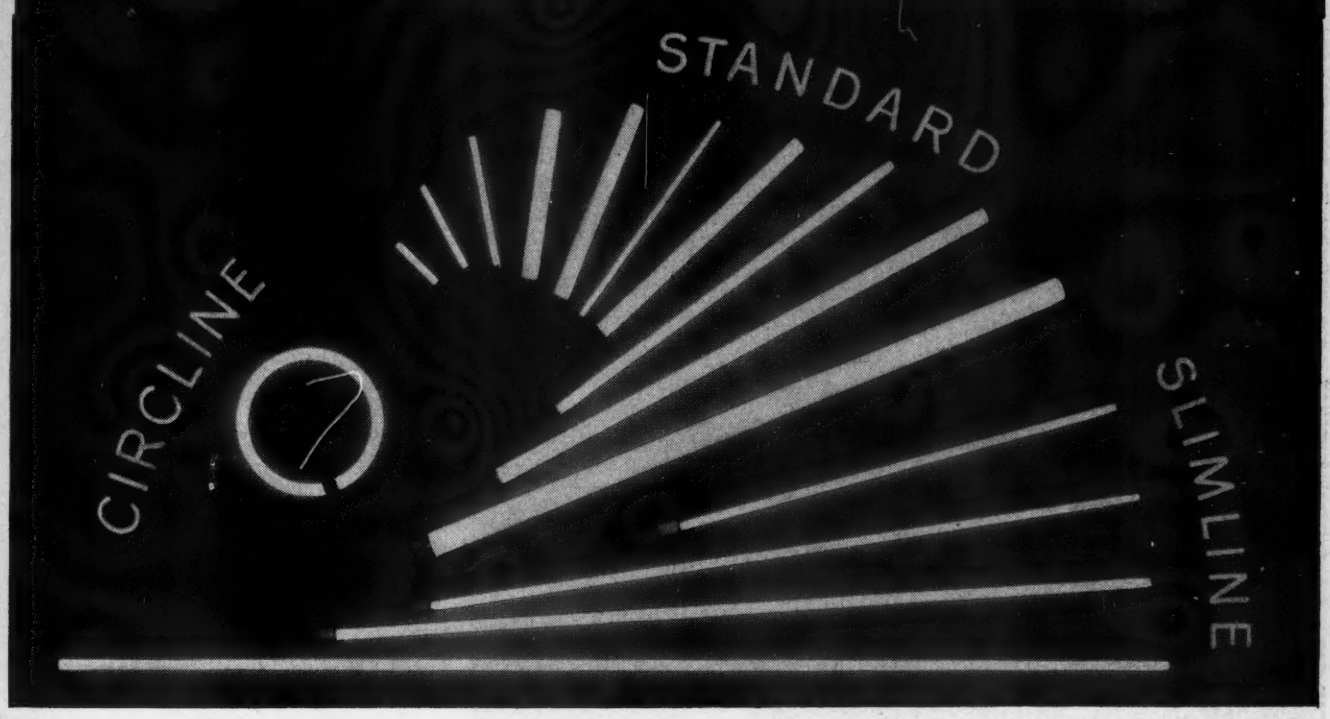
Prior to conversion, the Chamber area housed a section of the wartime assembly department of the Sperry Gyroscope Company. Power was distributed over the area through 500 amp. plug-in bus ducts suspended beneath the framework of roof beams and lighting was from two-lamp industrial fixtures holding 100 watt 5 foot 3500 degree fluorescent lamps. In constructing the Council Chambers, the bus ducts were removed and relocated above the I-beams to allow maximum headroom while the original continuous light troffers were stripped of their reflectors, lamps and ballasts.

In revamping the lighting plan, the original lampholders and troffers were reused but the 100 watt 3500 degree lamps were replaced by the new white 4500 degree low brightness (40-watt 60-inch T-17) lamps to achieve a softer, whiter illumination. New instant-starting, high power factor G.E. Tulamp ballasts were installed with audio filters for the elimination of hum and possible radio interference. In mounting, the troffers were suspended 12 inches below a white acoustical ceiling with the continuous runs 5 feet on centers. Since individual reflectors were not installed behind the lamps, the white ceiling acts as a diffusing and reflecting medium for light as well as an absorbing medium for sound.

Control of the lighting is by two electrically operated circuit breakers activated by pushbutton stations located adjacent to a side entrance.

Fig. 1—Egg-crate louvred ceilings illuminate both Council Chambers with average intensity of 55 footcandles. Lamps used are 60-inch, low brightness new white (40-watt T-17 4500 degrees) units installed with audio filters to eliminate radio interference.

Now! A complete line of G-E Fluorescent Lamps in the popular new 4500 white

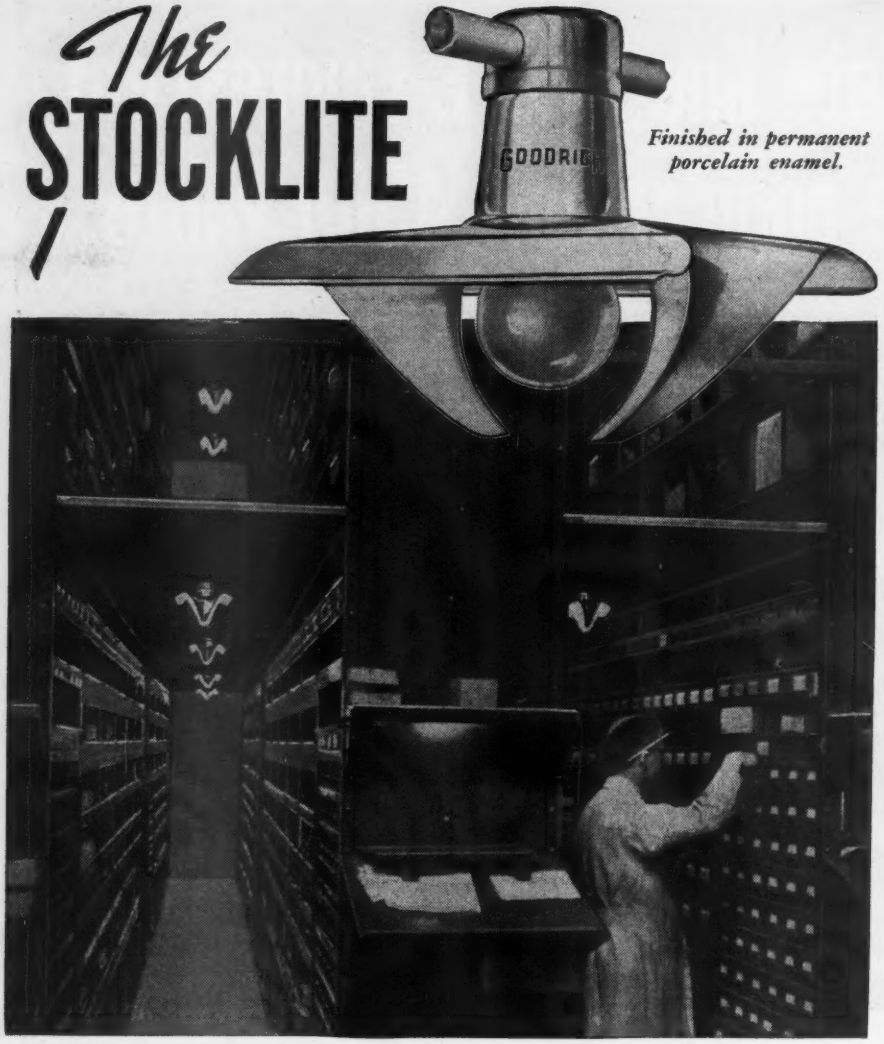


No one color of fluorescent light is best for all purposes. But it's significant that since G-E introduced the new 4500 White in 40 and 100-watt lamps a year ago, the popularity of this refreshing color has grown by leaps and bounds. Now, to meet an ever-increasing demand, G-E has placed in production a complete line of 4500 White Fluorescent Lamps, from 6 to 100-watts, including Slimline and Circline.

4500 White was developed by General Electric Research to provide a fluorescent lamp with color characteristics between the 3500 White Lamp and the 6500 Daylight Lamp. Here's a happy medium in white lighting . . . cool without being cold . . . near enough to daylight to meet most needs for color discrimination . . . and psychologically pleasing for indoor illumination use.

Before you order new lamps, be sure to see the new 4500 White. Call your G-E lamp representative and ask for a demonstration.

The STOCKLITE



Finished in permanent porcelain enamel.

Take Stock of Your STOCK ROOM LIGHTING

You can't have efficient stock room service without efficient illumination! If you're using ordinary fixtures, you'll be amazed at the improvement the Stocklite makes.

Designed specifically for this purpose, the Goodrich Stocklite provides uniform illumination of shelves from top to bottom row. Glare in the aisles is eliminated by the curved V-shaped reflecting surfaces which direct light to the sides, building up intensities in bin interiors. Comfortable vision everywhere in the aisle expedites order-filling, minimizes errors, makes workers more efficient.

In the long run, correct stock room illumination costs less, so why not have it? Get all the facts about the Goodrich Stocklite.

WRITE FOR THIS BULLETIN. *Full particulars about correct stock room lighting are available in this interesting illustrated booklet. Write for your copy today. Ask for Bulletin 91.*

RLM

Sold Through Electrical Wholesalers

GOODRICH
ELECTRIC COMPANY
4600 BELLE PLAINE AVENUE, CHICAGO 41, ILLINOIS

The eggcrate ceiling is 6 inches in depth with louvres spaced 10 inches apart in both directions. Suspended 12 inches below the lamps, the louvres receive and transmit diffused light with little variation in intensity between the areas directly under the lamps and the sections between the luminous rows. Each section measures 30 by 70 inches and is held in position against a suspended mounting framework by four spring latches. The latches are easily sprung for removal of the eggcrates for maintenance inspections and lamp replacement.

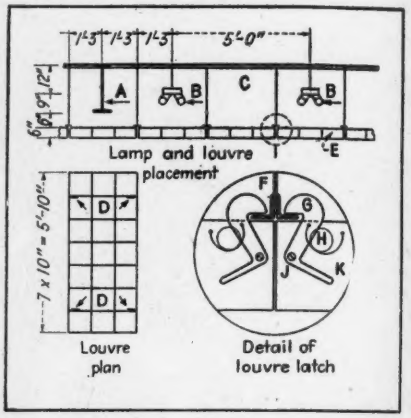


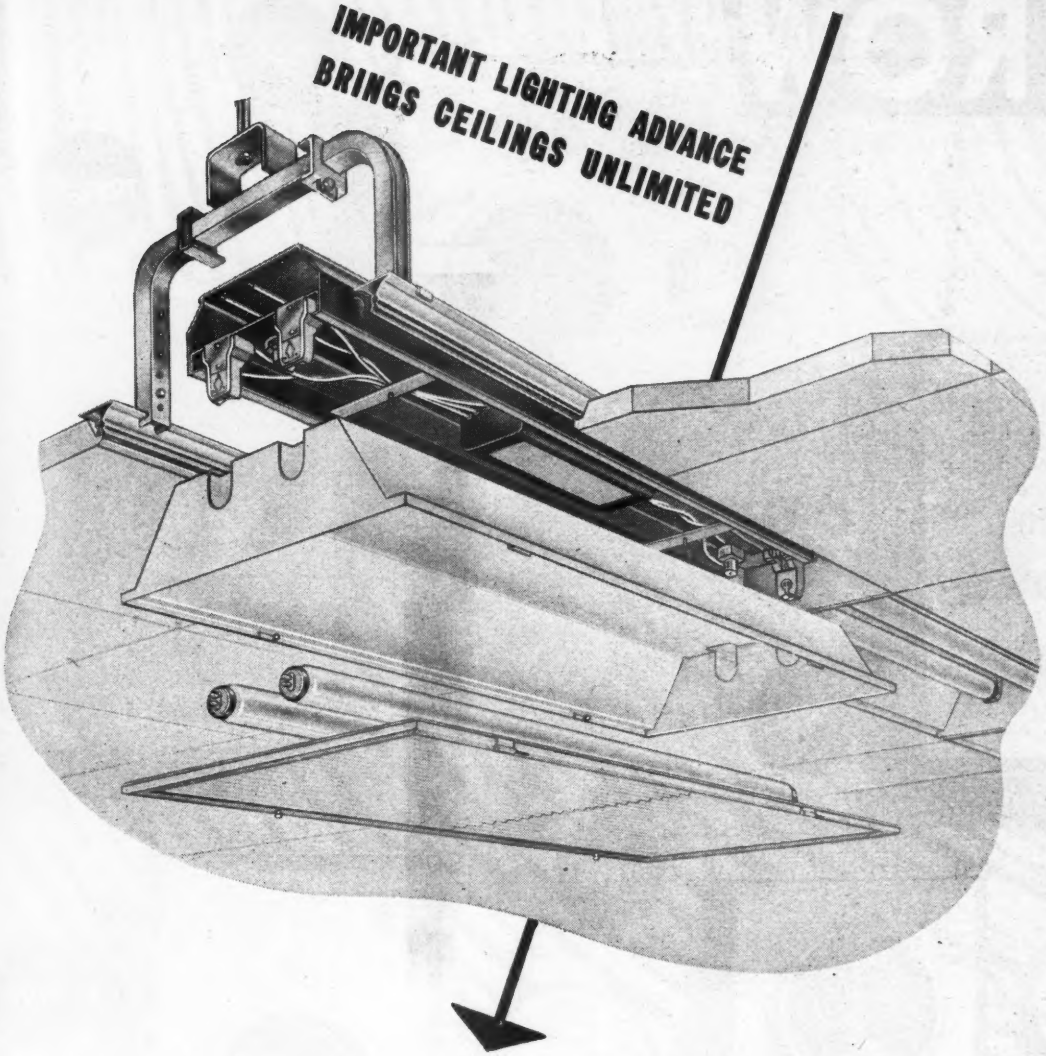
Fig. 2—Mounting detail indicates location of lamps (B) with respect to I-beams (A), acoustical ceiling (C) and eggcrate louvers (E). Louvre plan shows location of holding latches (D) while circled latch detail reveals cross-section of angle-iron mounting frame (F) and relative positions of catch (G), spring (H), pivot (J) and thumb toggle (K) for springing catch and removing louvres.

Illumination for the press area at the rear of the halls is from 150 watt incandescent lamps recessed behind square lensed plates set flush with the acoustical ceiling. Lighting for the 24 surrounding radio and camera booths is only that which passes through the sound-proofing glass from the main chamber. High intensities of illumination for photographic purposes are achieved by the use of twelve 1000 watt floodlights, recessed above the louvred ceiling immediately in front of the curved council table and rheostatically controlled.

As was the case in the former interim headquarters at Hunter College, the Council Chambers are richly plain. No flags, flowers, pictures or murals detract attention from the main focal point—the curved discussion table of the delegates.

Electrical contractors B. Eichwald and Co., Inc., and Robert Glenn, Builders, worked under the direction of Architects and Engineers Voorhees, Walker, Foley and Smith, all of New York City. Louvres were designed and manufactured by The Frink Corporation, Long Island City.

IMPORTANT LIGHTING ADVANCE BRINGS CEILINGS UNLIMITED



THE MILLER FLUORESCENT TROFFER LIGHTING SYSTEM — an important engineering achievement, makes it possible for stores, offices, schools, factories and public buildings to be planned around the lighting. Fixtures merely provide light but this complete lighting system provides light at the overall level desired, and in addition, it can be installed as single units, blocks, geometric patterns or light strips to form any ceiling pattern desired . . . CEILINGS UNLIMITED. Consider these economies — (1) the MILLER CEILING FURRING HANGER (patented) reduces number of supports needed from structural ceiling and simplifies installation; and (2) completely wired continuous channels (MILLER pioneered) reduce wiring costs, conduit and conduit fitting costs from 50% to 80%.

MILLER field engineers are conveniently located to serve you.

THE MILLER COMPANY

MILLER

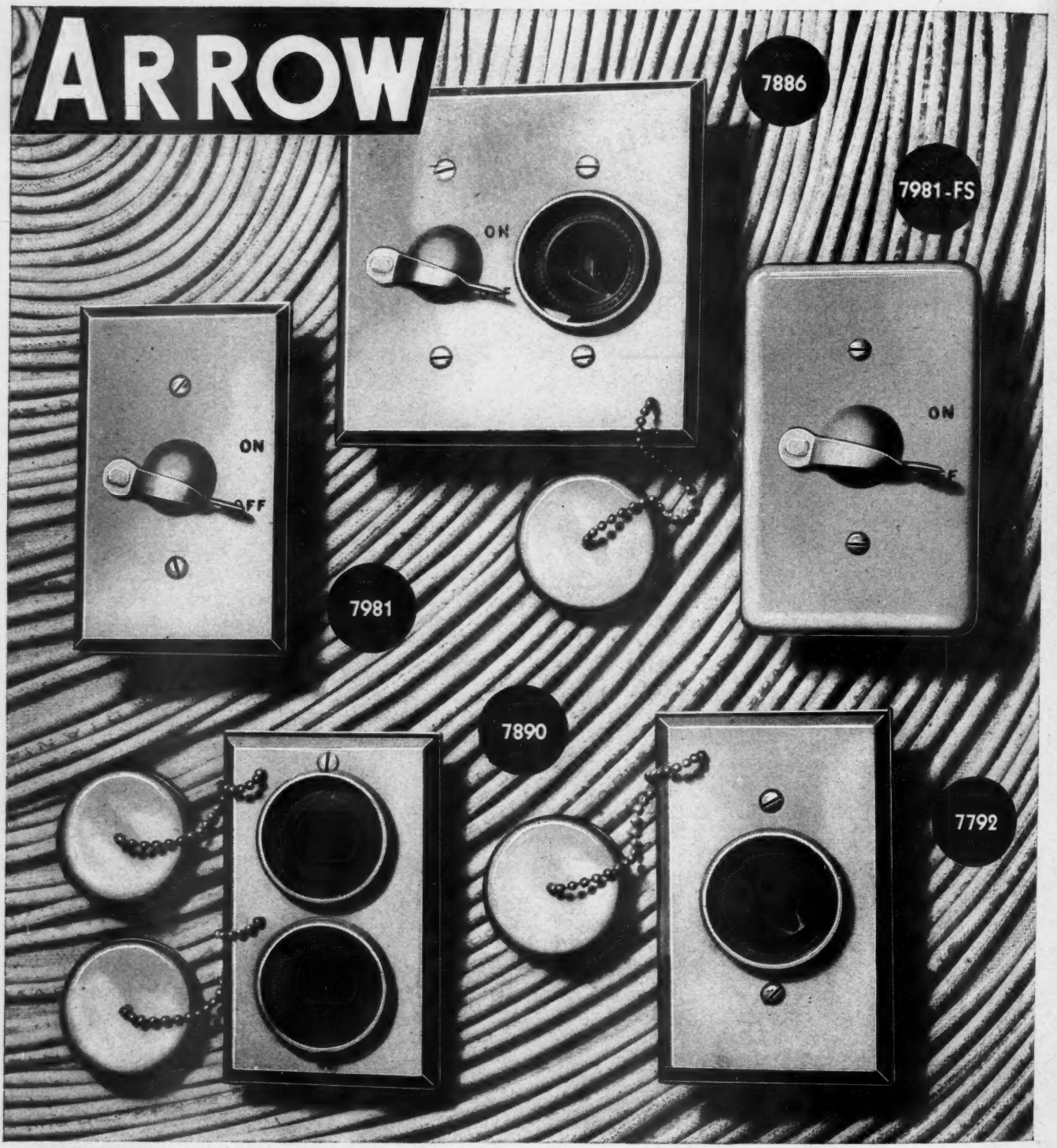
ILLUMINATING DIVISION, MERIDEN, CONNECTICUT

ILLUMINATING DIVISION
Fluorescent, Incandescent Mercury Lighting Equipment

HEATING PRODUCTS DIVISION
Domestic Oil Burners and Liquid Fuel Devices

ROLLING MILL DIVISION
Phosphor Bronze and Brass in sheets, strips and rolls

FOUNDRY DIVISION
Non-Ferrous Metal Castings



WEATHERPROOF SWITCHES and RECEPTACLES

Designed for outdoor applications—from porches and patios to factory platforms—*and* industrial inside installations subject to excessive moisture. No. 7886,—2-gang unit, single-pole Switch and Receptacle, with cadmium-finished brass plate fitting over weather-tight rubber mat. No. 7981,—Single-pole Switch with cadmium-finished brass plate and weather-tight rubber mat. No. 7981-FS,—Switch for use with "FS"-type fittings for industrial jobs. Aluminum-sprayed steel plate with rounded edges; moisture-tight mat. (Above switches available also in double-pole, 3-way and 4-way.) No. 7890,—Duplex Receptacle with .060″ gauge brass plate, metal caps, weather-tight rubber mat. No. 7792,—Single Receptacle with cadmium-finished brass plate, metal cap and weather-tight mat. *Sold through Electrical Wholesalers.* ARROW ELECTRIC DIVISION

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN., U. S. A.

Keep Up-to-date on new Developments

through this FREE SERVICE . . . . . .

Electrical Contracting brings you the latest literature of leading manufacturers without cost or obligation.

FLUORESCENT FIXTURES

1 Letter sized folder contains nine glossy photographs of new 20, 40 and 100 watt fluorescent fixtures of commercial and industrial design. Price list included. Tri-Part Mfg. Co.

HEATING COILS

2 Two-color, 8½ by 11-inch bulletin 136-4 covers specifications and prices of replacement elements for irons and room heaters, hot plates and coils for household accessories and appliances. St. Clair Electric Products Co.

TRANSFORMERS

3 Dry type transformers, Type E, designed for indoor use and of capacities up to 5 kva. are presented in 4-page, letter size folder. Capacities, dimensions and shipping weights are included with pictures and engineering sketches. R. E. Uptegraff Mfg. Co.

FLUORESCENT FIXTURES

4 Two-color, 16-page bulletin pictures, sketches and discusses line of four lamp, 40-watt commercial fixtures. Mobilite, Inc.

JACKS

5 Duo color 40-page booklet describes improvements in line of lifting jacks. Catalog 203 contains complete discussion of rachet, screw, air motor operated and hydraulic units. Photographs, application data and illustrations are included. Duff-Norton Mfg. Co.

CONTROL DEVICES

6 Bulletin 100,000 is descriptive 8-page pamphlet concerning a-c and d-c motor starters, speed and voltage regulators, resistors, ring and plate rheostats, switches, magnetic contactors, relays and dimmers. Ward Leonard Electric Co.

MANUAL SAFETY SWITCH

7 Data sheets No. 38 include line drawings, pictures, wiring diagrams and technical information of BZE-2RQ4 Switch for manual safety control of air presses, punch presses and hydraulic presses. Micro Switch.

SHINGLES AND STAINS

8 Catalog 247 in natural process colors presents information on the use and the advantages of Creo-Dipt red cedar shingles and insulating backing board. Section drawings, reference data charts and recommendations for installation are featured. Creo-Dipt Co., Inc.

MASONRY DRILLS

9 Pocket sized folder gives description, specifications and prices of new carbide tipped masonry drills. Metro Tool and Gage Co.

INSULATED WIRE

10 A 16-page, 4-color bulletin (GEA 4352) tells the story of Flamenol insulated wire and cable. Manufacturing steps and tests are described. Illustrations show applications in various industries. Types, ratings and specifications are included. Companion 2-page bulletin (GEA 3612B) describes application to mines for telephone purposes. General Electric Co.

RUBBER JACKETED CABLES

11 Two tone pamphlet on underground rubber jacketed cables includes specifications, description, splicing directions and drawings. Simplex Wire and Cable Co.

TEMPERATURE RECORDER

12 Eight-page, 2 color bulletin (GEA 4572) describes inkless temperature recorder Type CF-2 with applications discussed for generators, transformers, ovens, air ducts and complete specifications. Accessories are also described. General Electric Co.

PUMP CONTROL

13 Bulletin T-1130 discusses classes of pump automatic controls, outlining operation, showing wiring arrangement and listing advantages. Protectrol Automatic Control Co.

BRUSHES

14 Carbon brushes, including dimensions, prices and recommendations for their use are thoroughly discussed in Catalog 15 (for d-c arc welders) and three folders (Kit 8 for

Circle numbers, sign and paste on your letterhead and mail in an envelope.

ELECTRICAL CONTRACTING **November**
330 West 42nd St.
New York, 18, N. Y. **(Not good after January 1)**

Please send me without obligation, manufacturers' literature herein described and identified by numbers circled below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42
43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58												

NAME..... TITLE.....
COMPANY .....
ADDRESS .....
CITY..... STATE.....

Foolproof Assembly

WITH THE New

ROYAL-NOARK Renewable FUSE

YOU'RE ALWAYS RIGHT...YOU CAN'T ASSEMBLE IT WRONG!

EVERYTHING in a RENEWABLE FUSE

- ✔ SIMPLICITY OF DESIGN
- ✔ FEWER PARTS
- ✔ EASIER TO RENEW
- ✔ EASIER TO ASSEMBLE
- ✔ PROPERLY VENTED
- ✔ RUGGED QUALITY

ROYAL Quality WIRE • CORD SETS
CARTRIDGE and PLUG FUSES • FUSTATS
TROUBLE LIGHTS • CHRISTMAS LIGHTING SETS

ROYAL ELECTRIC CO., Inc., PAWTUCKET, R. I.

magnetos, Kit 35 for multi-purpose use and Kit 45 for refrigerator motors). Ohio Carbon Co.

A-C AND D-C GENERATORS

15 Form 646 18-1 pictures, discusses construction and suggests application for a-c and d-c generators and motor-generator sets from 50 watts to 200 kw. Century Elec. Co.

ASBESTOS CABLES

16 Illustrated bulletin describes types of heat and corrosion resistant wires and cables, giving overall picture of products insulated with impregnated felted asbestos and including cables for power apparatus, multiconductor switchboards and appliances. Okonite Co.

STREET LIGHTS

17 Spherolite luminaires for street lighting application are discussed in 28 page, two color booklet. Section drawings, photographs, light curves, specifications and recommendations for properly locating units are included. Line Material Co.

SYNCHRONOUS CONTROL

18 The ABC of Synchronous Motor Control, a three color 20-page booklet, discusses the story of control, the method of starting and the principles of operation, and descriptions of magnetic full and reduced voltage control and Hi-Fuse combinations. Electric Machinery Mfg. Co.

TRANSFORMERS

19 Bulletin S-401-A illustrates and describes oil immersed distribution transformers, including new tables. Standard Transformer Co.

ILLUMINATION DESIGN

20 Design and maintenance of interior lighting installations is subject of 8-page folder covering popular types of luminaires, lamps and ballasts. Rules and tables, curves and prescribed methods are presented in two color printing. Westinghouse Electric Corp.

ROTATING ELECTRICAL EQUIPMENT

21 Catalog 46-1 presents general picture of a-c, d-c and universal motors for special motors constructed to specification, dynamotors and converters, motor generator sets, gas and electric generating plants. Electric Specialty Co.

INDUSTRIAL LIGHTING

22 Industrial Fixture Bulletin 30-A presents installation data, dimensions, prices and accessories for 2 and 3-lamp fixtures holding 40 and 100-watt lamps. Daybrite Lighting Inc.

CAPACITORS

23 Catalog 195A includes latest specifications on C-D electro-

Excellent electrical properties
Thin coating of insulation
More conductors in a given space
Ease of handling
Easy stripping
Light weight
Resistance to ozone, wear, sunlight, water, chemicals, and most other normally destructive factors
14 colors including NEMA standards

Wire insulation made with GEON has ALL these advantages

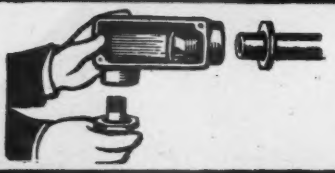
Geon
Polyvinyl Materials
A TRADE MARK OF B. F. GOODRICH CHEMICAL COMPANY

Be sure to specify wire or cable insulated with GEON in order to get *all* these advantages. Or, for information regarding special applications please write Department Y-11, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

They use RIGID and THIN-WALL conduit



They often have to CHANGE FITTINGS

Fittings must resist constant VIBRATION

What a Spot for KONDU!

Only with Kondu fittings can you use Thin-Wall Tubing at any outlet . . . and take one fitting out of the line and put in another, without disturbing conduit. And Kondu fittings hold permanently tight . . . vibration proof. Practically unbreakable . . . 100% re-usable.

Write for the Kondu Catalog.

KONDU CORPORATION
Erie, Pa.

KONDU MFG. CO. LTD., Preston, Ontario

lytic, paper and mica capacitors in addition to test instruments and interference filters. Design and engineering information, dimensional sketches, physical properties and installation instructions are contained in this 24 page booklet. Cornell-Dubilier Electric Corporation.

PERMAFLECTORS

24 Catalog 46 presents complete line of Permaflector incandescent lighting equipment for commercial, institutional and industrial applications. Photographs, distribution charts, installation diagrams, product details and cross referenced index are included in 126 pages. Pittsburgh Reflector Co.

SWIVEL LIGHTS

25 Bulletin 114 is file sheet giving specifications, prices and physical data on single and multiple swivel lights for either outlet box attachment or pendant suspension. Swivelier Co.

VERTICAL MOTORS

26 Protected type motors designed for close coupling to centrifugal pumps, agitators, atomizers and machine tools are described in letter size bulletin SL-300-3. Drawings and design data explain recessed junction box, balanced rotor and vinylastic insulation. Crocker-Wheeler Electric Mfg. Co.

FARM WELDER

27 Repairs, construction, modification, design and engineering specifications of welder manufactured for farm use are contained in bulletin GEA 4630. General Electric Co.

PORCELAIN

28 Booklet on electrical porcelain tells history, uses and adaptability for different types of insulation. Material compiled by 13 cooperating manufacturers. Explanation of ingredients, strengths, resistance to acids, corrosion and thermal shock and other physical properties included. National Electrical Manufacturers Association.

TRANSFORMER DEMONSTRATOR

29 New CSPB Transformer Demonstration Chart shows how banked secondary transformers operate under various conditions by revolving cardboard disc behind cutout pattern and explanation card. Westinghouse Electric Corp.

REMOTE SERVO MOTOR

30 Two pages illustrating 60 cycle, 2 phase, low inertia Servo-Motor for remote control. Performance chart and features of construction explained. Transicoil Corp.

SELF-FLUXING SOLDER

31 Self-fluxing solder with three cores located beneath outer surface of wire is presented in 2 color, 4 page folder. Alpha Metals, Inc.

1946 CODE

32 Revisions of 1946 NEC as applied to wire manufacturing, insulation and use are contained in pocket sized 24-page booklet. Rome Cable Corp.

THERMOPLASTIC WIRES

33 Line of thermoplastic wires and cables presented with engineering data, applications and capacities. Cables described include building wires, portable cords, tool and control wiring. Rome Cable Corp.

ELECTRIC HEAT

34 Heating the Modern Home Electrically is new 20-page brochure 46-D discussing trend towards electrical home heating by portable units and down-flo built-in-wall heaters. Electromode Corp.

SELENIUM RECTIFIERS

35 New 8-page bulletin illustrates and describes various types of standard selenium rectifier equipment for d-c requirements. Specifications and ratings are included. Radio Receptor Co., Inc.

CONNECTORS

36 Mechanical Principles of Gorilla Grip Electrical Connectors is title of booklet 466, sized 8½ by 11 inches and in two colors, describing with cutaway models and schematic drawings the operation of this product. National Electric Products Corp.

GENERATORS

37 Generating A-C Electric Power includes data, description and pictures of gas engine driven plants from 500 to 25,000 watts, prices and shipping weights. Kato Engineering Co.

INDUSTRIAL LIGHTING

38 Solution to 12 industrial lighting problems are illustrated by means of photographs of actual installations with information as to reasoning behind design. Westinghouse Electric Corp.

ELECTRONIC TUBES

39 Electronic tubes described in two-tone folder. Ratings, general characteristics, diagrams and curves for each type discussed. Chatham Electronics.

SPEAKERS

40 Super power speakers, reflex projectors, driver units, radial horns and specialized marine and railway speakers are discussed in 24 page booklet. Drawings, applications and specifications are included. University Loudspeakers, Inc.

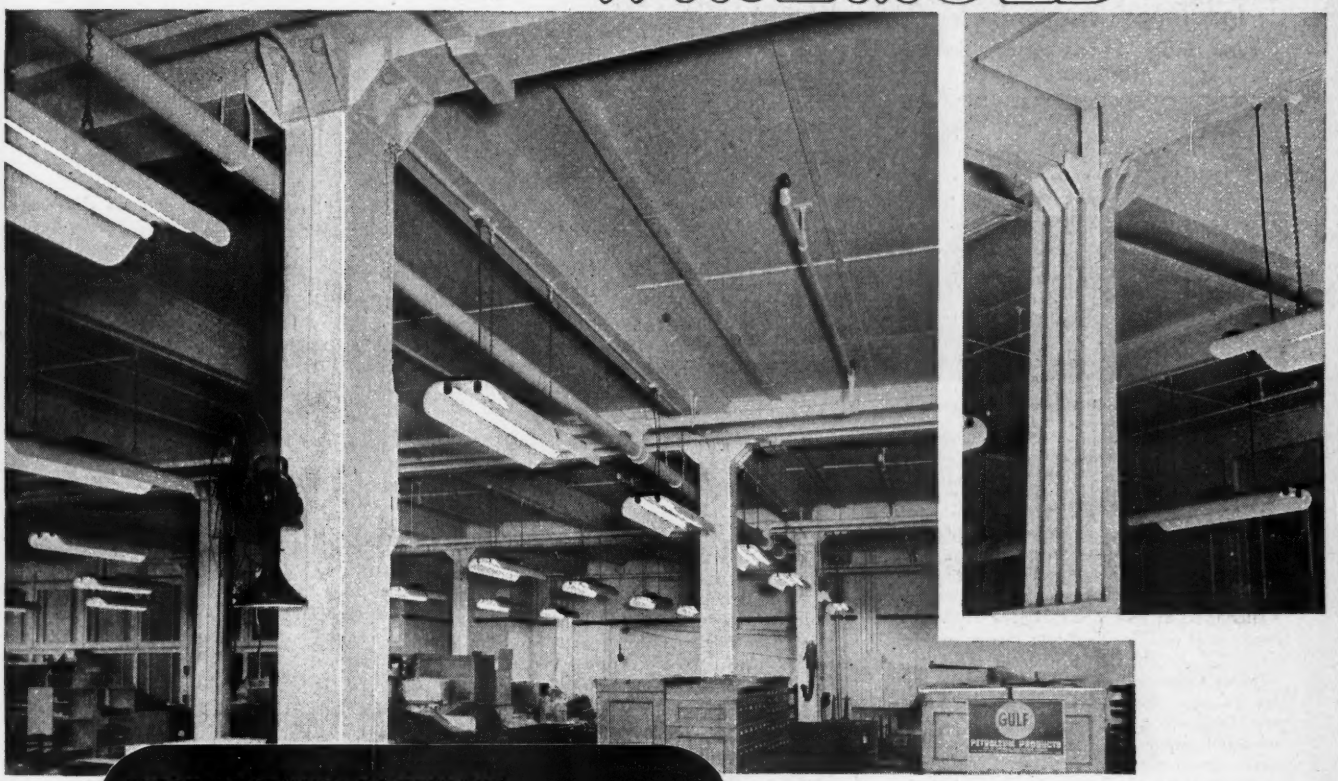
FLUORESCENT STRIP

41 Letter-sized folder presents details on 24, 48 and 96-inch sin-

FROM PANEL BOX . . .

TO OUTLETS

WIREMOLD IT!



"BEST LOOKING RACEWAYS . . .
EASIEST TO HANDLE"

SAY LEADING ELECTRICAL CONTRACTORS

Wiremen who have been using Wiremold for years know that a better wiring job can be done faster and more economically with Wiremold methods and materials.

They've found it easier to cut Wiremold Raceways to accurate length on the job. They like the smooth, sure way wires fish through Wiremold. They find Wiremold fittings "just right" for the application . . . with a minimum number required to take care of all needs and to provide COMPLETE INTERCONNECTABILITY.

With Wiremold no special tools are required, all joints and connections slip or snap permanently in place. Future extensions or relocation of wiring are greatly simplified. Wiremold provides the special fittings and methods necessary to meet growing demands for fluorescent, showcase, wall case, and built-in lighting, as well as PLUGMOLD "Plug-in-Anywhere" Systems and PANCAKE Overfloor Wiring Systems.

A new Wiremold Catalog is available now. A new Wiring Guide is in course of preparation. If you are not on our mailing list write . . . today.

THE WIREMOLD COMPANY
HARTFORD 10, CONN.

Know your WIREMOLD
NEMA
.... MORE THAN ADEQUATE WIRING
FROM PANEL BOX TO OUTLETS

Silicone News

DC

It's NEWS when a Silicone insulated motor fails

EVEN UNDER MOTOR KILLING TEST CONDITIONS

Class B Insulated Motor failed after 3760 hours at 200°C. | *Silicone Insulated Motor failed after 5178 hours at 300°C.*

In spite of operation for a longer time at a temperature 100°C. above the operating temperature of the Class B motor, both windings look about alike and show about the same degree of deterioration.

For three years we have subjected Silicone insulated motors to accelerated life testing in our Motor Test Laboratory—trying to make them fail so that we would have a better idea of how good Silicone insulation really is. In addition to drastic thermal aging at 200°C. to 310°C. (590°F.), the test cycle includes exposure to 100% relative humidity for 24 hours followed by a high potential test. Even with such abuse, only one Silicone insulated motor has failed—and that is a most significant failure.

You can do a lot with a margin of 100°C. above the top limit for Class B insulation. Before long that will show up in new designs for motors. Right now standard frame motors rewound with Silicone insulation will give you:

Much greater reliability.
Greater overload protection.
Immunity to ambient temperatures.
Greater moisture resistance.
Reduced fire hazards.

Instructions on how to apply DC 996 are contained in leaflet No. K 3-2.

AND ALSO there are now available DC Silicone Greases described in leaflet No. K 7-2; Silastic* insulated lead wire; and DC Silicone paint resins to supplement silicone insulation for motors operating at high temperatures.

*Trade mark, Dow Corning Corporation

DOW CORNING CORPORATION
MIDLAND, MICHIGAN
Chicago Office: Builders' Building
Cleveland Office: Terminal Tower Building
New York Office: Empire State Building
Canada: Dow Corning Products Distributed by Fiberglas Canada, Ltd., Toronto

Dow Corning
FIRST IN SILICONES

gle-lamp fluorescent strip units with prices, accessories and recommended locations for use. Moe-Bridges Corp.

WATERPROOF CONNECTOR

42 Bulletin W-146 discusses Type W waterproof connectors designed for sub-marine work in swamps, lakes, underground and around docks. Drawings and specifications are contained in 4-page, 2-color folder. Cannon Electric Development Co.

HARDWARE CATALOG

43 New 450-page catalog is series of colored spreads showing items with description, use and price. Twelve sections with tabbed indexes and special binder which lies flat and permits addition of material are features. Yale and Towne Mfg. Co.

MICRO SWITCH

44 Catalog 61 describes complete line of housings for micro-switch snap action, actuators and auxiliary devices for industrial and commercial application. Convenient reference numbering of sections, drawings and pictures, technical data and prices are included. Micro-Switch.

SELF-LUBRICATING BEARINGS

45 Six-page folder in 2 colors shows construction, application and cross-sections of impregnated hardwood bearings recommended for household appliances, agricultural and printing machinery, conveyor equipment and looms. Nolo Oilless Bearing Co.

SECONDARY BANKING

46 Multi-colored booklet describes how CSPB transformers overcome disadvantages of conventional banked secondary systems. Diagrams show radial, network and conventional systems as well as new CSPB unit. Westinghouse Electric Corp.

WELDING CONTROL

47 GEA 4571 covers the Importance of Control in Resistance Welding, discussing various types of welding, timing the current, adjustment and control. Diagrams, sketches, step-by-step procedures and description are contained in this 12-page 2-color pamphlet. General Electric Co.

FRAMING STRUCTURES

48 Unistrut metal framing for storage racks, machinery supports and tables is subject of folder containing sectional pictures and explanation of product. Unistrut Products Co.

RELAYS

49 Bulletin 104 on midget metal base relays for small radio transmitters, aircraft control circuits and applications where space is limited includes sketches, physical data and dimensional drawings. Ward Leonard Electric Co.

RADIANT LAMPS

50 Radiant Lamps for Educational Institutions illustrates lamps suggested for projectors, floodlights, spotlights and weatherproof units for outdoor use. Radiant Lamp Corp.

FLUORESCENT LIGHTING

51 Multi-colored folder tells story of special tests, studies and conclusions reached in lighting of West Point. Also includes recommendations for schools, drafting rooms and offices. Edwin F. Guth Co.

POLYPHASE MOTORS

52 Form 643 presents slip ring induction polyphase motors ranging from 1 to 350 horsepower in capacity. Performance data, construction, sectional drawings and discussion of features are in this 2-color 8-page folder. Century Electric Co.

TRANSFORMERS

53 Bulletin 120 illustrates Type CR current transformer for circuits up to 5000 volts. Physical data is part of the coverage. R. E. Uptegraff Mfg. Co.

HANDBOOK

54 A 16-page letter-sized brief handbook shows variety of electrical equipment ranging from a-c and d-c motors of ½ to 50,000 hp. to electronic heaters. Tables, data, descriptions and ratings are included. Designation of handbook is B-6452. Allis-Chalmers Mfg. Co.

SQUIRREL CAGE MOTORS

55 Bulletin 720 covers Type OG protected type standard squirrel cage induction motors. Steps in manufacturing and performance data augment drawings and photographs. Louis Allis Co.

ROD SELECTION

56 Two-color chart measuring 18 by 22 inches lists variety of low temperature welding rods for use with oxy-acetylene, metal arc, furnace, carbon arc and induction heating. Sizes, metals on which to use, recommended applications, strength and other physical properties are tabulated. Eutectic Welding Alloys Corp.

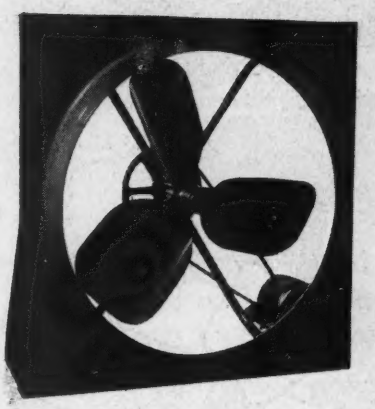
CONDUIT FITTINGS

57 File sheet describes Types CF-1 and CR-1 couplings for ½-inch flexible conduit and thin wall tubing to conduit. Cannon Electric Development Co.

AERIAL CABLES

58 Two folders, Numbers 116 and 117, discuss aerial cables and self-supporting aerial cables. Construction, carrying capacity, applications and advantages, installation notes and splicing are included. Simplex Wire and Cable Co.

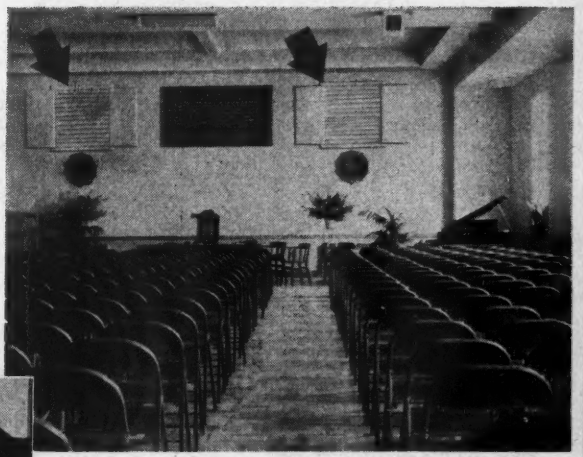
7 LAU FANS went into this one job



Middletown, Ohio, Post No. 218
The American Legion Home Addition

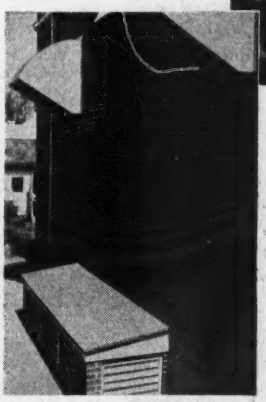
A convincing case example of the huge sales and profits opportunities in LAU "NITEAIR" EXHAUST FANS

SEVEN LAU Propeller-type Exhaust Fans were installed in this new building addition—two in the auditorium, two in the basement game room, one on the roof (in a penthouse) over the taproom, one for general offices, and one outside the small card room. Besides, the contractor used LAU Blowers in all heating units and for ventilating toilet rooms.



Auditorium: 72' x 43' with 14' ceiling. Seats 450. 2—42" fans.

Basement: same size with 9' ceiling. 2—30" fans.



Showing protected fan exhausts.

Lau Propeller-type "Niteair" Fans have been designed for a wide variety of applications where it is necessary or advantageous to exhaust undesirable air and provide fresh air from the outside. Equally applicable for industrial, commercial, residential, farm and public buildings.

Installation at the time of construction adds little to construction cost. Every installation becomes a silent salesman for this comfort-creating product. Six sizes—18 in. to 48 in. Cash in NOW on the opportunities available to you in LAU FANS. Write us direct or contact your jobber.

THE LAU BLOWER COMPANY
DAYTON 7, OHIO, U. S. A.

MEMBER NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASSOCIATION — INDOOR COMFORT

WORLD'S LARGEST MANUFACTURER OF FURNACE BLOWERS

THEY TAKE "ON" AND "OFF" TIMES FROM THE SUN

SANGAMO
Astronomic Dial
TIME-SWITCHES

Both of the Sangamo Time Switches shown here are equipped with Astronomic Dials.

Automatic in Operation

• The daily change in the length of day and night throughout the year necessitates periodic re-settings of the "on" and "off" operations of conventional time-switches. Not so with a Sangamo Time-Switch equipped with an Astronomic Dial! For convenience sake, it is frequently preferable to specify this control which is fully automatic, and requires no re-setting. On flood-lighting, yard-lighting, and especially on advertising-lighting installations, the "on" and "off" operations change every day in exact accordance with the setting and rising of the sun. There are other features of convenience described with the Sangamo Time-Switches shown on this page. Decide on what you need—then order for future delivery.

FORM KAZ

In addition to the astronomic "on" and "off" operation, this switch permits the "off" operation at any time between 9:30 P.M. and 2:15 A.M. If desired the time-switch can be operated manually without affecting subsequent automatic operations. It is available in a wide variety of combinations providing two-circuits, duplex, and outdoor switches; also with Sunday and holiday omitting device, as well as advance time cutoff.

FORM VSWZ

Equipped with astronomic dial, Form VSWZ also provides for continuous operation during power interruptions through its electrically wound movement — although it is normally synchronous motor operated. This "carryover" feature is entirely automatic, eliminating the necessity of resetting the dial after power interruptions up to ten hours, thus insuring dependable and accurate timing under all conditions.

WRITE NOW FOR CIRCULAR NO. 205

It contains compact and concise information on the wide variety of control features available in various forms of Sangamo Time-Switches, including outdoor types.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

In the News

McGraw Award To E. C. Huerkamp

Edward C. Huerkamp, sales manager of the lighting division of Westinghouse Electric Corporation, Cleveland, received the James H. McGraw Award Manufacturers Medal for 1946. Presentation was made by S. B. Williams, editor of *Electrical World* and secretary of the Committee of Awards, at the luncheon held in Atlantic City on October 30 during the annual meeting of the National Electrical Manufacturers Association.

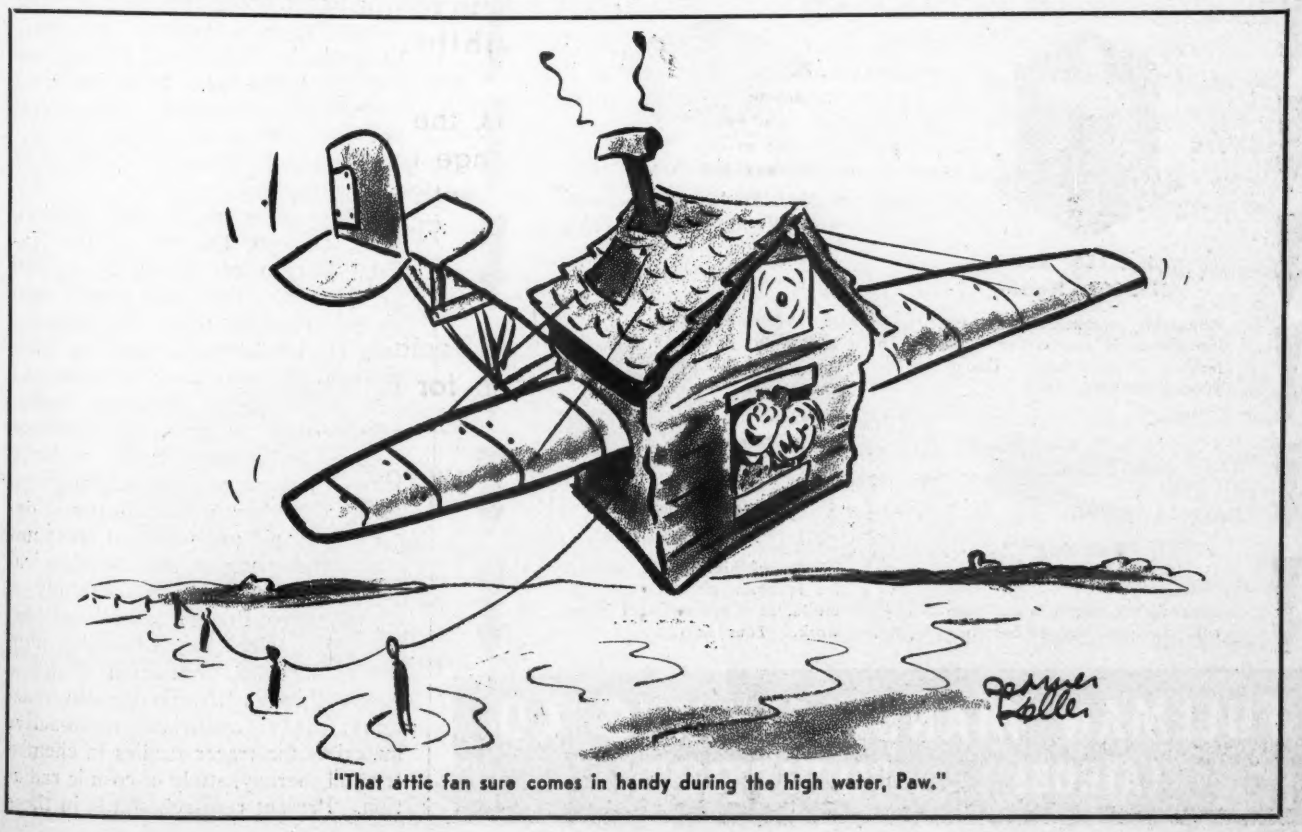
The citation, accompanying the award, read as follows:

"Seldom is a great national program conceived in all its ramifications by any one individual, yet if it is to be a success it must have the unselfish leadership and guidance of someone with the initiative, enterprise and inspiration which will command the confidence of his fellow workers in the industry and thereby marshal their enthusiastic support. In directing the first International Lighting Exposition this spring Edward C. Huerkamp, sales manager of the lighting division of Westinghouse Electric Corporation, has rendered conspicuous service to the electrical industry and particularly to the manufacturers of lighting equipment.

E. C. Huerkamp

"Though the first exposition to be sponsored by the lighting equipment industry, it drew by invitation nearly ten thousand people from this and other countries to see what new trends had developed in lighting equipment and to participate in a series of educational meetings devoted to ways and means of promoting improved illumination. Never before had so many people gathered together at any one time to take part in a conference on lighting. Unlike other equipment shows this exposition was administered not for the primary purpose of stimulating orders but rather to focus attention on the lighting job waiting to be done and on the available tools in the way of sales programs, training courses, new knowledge and equipment. By bringing together at one time all of the different interests in the lighting market, the exposition gave visible evidence of the need for coordinated approach to this market that all from user to producer might receive the greatest benefit.

"Nor is this the only great service Mr. Huerkamp has rendered to his branch of the electrical manufacturing industry. He has been a leader in all its organized activities. Besides having been first chairman of the reorganized Commercial and Industrial Lighting Equipment Section of NEMA, he served on the Industry Advisory Committee of the War Production Board for four separate and distinct committees, namely, Commercial and Industrial Lighting, Flood Lighting, Street and Highway Lighting and Airport Lighting Committees and currently is a member of the OPA Lighting Fixture Industry Advisory Committee. At the same time, he is one of the directors of the Safety-Traffic Bureau of the Street and Highway Lighting Equipment Section of NEMA, Chairman of the important Technical Committee of the RLM Standards Institute responsible for preparing its specifications and Chairman of the new Public Relations Committee of the Illuminating Engineering Society.



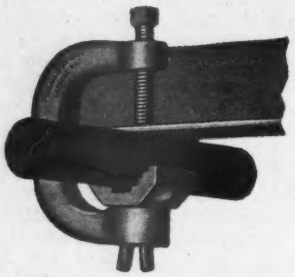
"That attic fan sure comes in handy during the high water, Paw."

FULLMAN Latrobe PRODUCTS

FLOOR BOXES WIRING SPECIALTIES

Preferred Throughout the Industry

Because of their high quality, ready adaptability, ease of installation and sure performance "Latrobe" Products have won widespread approval for all industrial, commercial and residential jobs.



No. 470 "Latrobe" Pipe or Conduit Hanger

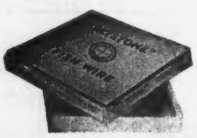
For hanging pipe or conduit ½", ¾" and 1" to steel beams up to ⅜" thick. Can be installed quickly.

No. 284 Nozzle with No. 200 Cover Plate

Duplex Receptacle Nozzle. Furnished with ½" or ¾" Brass pipe extension. Neat and practical.

No. 150 Box
No. 207 Nozzle

Adjustable watertight box for installation in concrete or wood finished concrete floors. Underwriters approved.



Keystone Fish Wire

Made of high quality flat steel wire. Tempered exactly right. Ten sizes.

"Bull Dog" B X Cable Staples

High quality staples in any quantity. Cartons, kegs or barrels.

"Bull Dog" Insulator Supports

Clamps of high tensile strength for fastening porcelain or glass insulators to exposed steel framework. Four sizes.

FULLMAN MANUFACTURING CO.
LATROBE . . . PENNSYLVANIA

"For his indefatigable efforts in behalf of the lighting equipment manufacturing industry, the Committee of Awards on recommendation of the judges present to Mr. Huerkamp the 1946 Manufacturers Medal and Purse given under the James H. McGraw Award."

The panel of judges who recommended Mr. Huerkamp for this honor consisted of Clarence L. Collens, Reliance Electric & Engineering Company; Frank C. Jones, Okonite Company; Leonard Kebler, Ward Leonard Electric Company; Frank Thornton, Jr., Westinghouse Electric Corporation and S. S. Williams, the Committee of Awards.

Conference Reveals Electronic Advances

Past accomplishments and future possibilities of electronic science were studied at the first peacetime National Electronics Conference held at Chicago's Edgewater Beach Hotel, Oct. 3–5. Jointly sponsored by the Illinois Institute of Technology, Northwestern University, University of Illinois, Chicago sections of the Institute of Radio Engineers and the American Institute of Electrical Engineers, and the Chicago Technical Societies Council, this national forum on electronic research, development and application will be held again next fall at the same place.

Some 2500 scientists, engineers and educators received latest reports of electronic advances in 60 papers presented at 19 different subject sessions. Many topics, previously under security censorship, were explored in detail. Although the majority of the sessions were devoted to radio, television, communications and related fields, several —as was true of the exhibits on display—covered industrial development and applications.

In his conference keynote address, E. U. Condon, Director of the National Bureau of Standards, divided the electronics field into eleven categories. Four of these: Communications (radar, loran, air and sea navigation aids); television; induction and dielectric heating; electronic instrumentation and control, are becoming mature, he noted. Basic research brings to the fore these future possibilities; development of electronic devices for rapid mathematical computation; mass spectrometers for chemical analysis and process control, study of the physics of the ionosphere, development of devices for producing high energy particles, production of atomic power through Uranium chain reactions; use of artificially radio-active materials for tracer studies in chemistry and therapy, study of cosmic radiation. Present research status in these

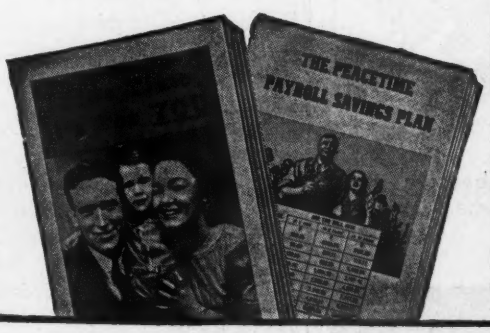
★ YOU HELP ALL 3 WITH THE P. S. P.

● **Participants in the Payroll Savings Plan benefit directly in terms of cash—because U. S. Savings Bonds at maturity pay $4 for every $3 invested.**

Your company, your community, and your country benefit indirectly in terms of security—because: (1) Employees with a solid stake in the future are likely to be stable, productive workers. (2) The Bond-buying habit of local citizen-employees means a reserve of future purchasing power—a safeguard for the stability of your community. (3) Every Bond bought temporarily absorbs surplus funds and helps check inflationary tendencies.

You're doing everybody a favor—including yourself—by supporting the Payroll Savings Plan.

ARE YOU USING THESE BOOKLETS?



If not, or if you wish additional copies, just ask your State Director of the Treasury Department Savings Bonds Division.

The Peacetime Payroll Savings Plan—A booklet, published for key executives by the Treasury Department, containing helpful suggestions on the conduct of your payroll savings plan for U. S. Savings Bonds.

This Time It's For You—A booklet for employees ... explaining graphically how the payroll savings plan works ... goals to save for, and how to reach them with Savings Bonds.

The Treasury Department acknowledges with appreciation the publication of this message by

Electrical Contracting

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council

3 LABELS TO LOOK FOR
ON
FLUORESCENT LAMP BALLASTS

When a label is familiar to a buyer, it is usually because the organization so identified is long-established in its particular field.

Chicago Transformer ballasts can boast of three such labels—the C.T.C. emblem, a trademark of manufacturing experience, plus the U.L. and E.T.L. insignias, trademarks of two recognized testing laboratories.

C. T. C.—*Manufactured by Chicago Transformer.*
U. L. —*Approved by Underwriters Laboratories.*
E. T. L.—*Certified by Electrical Testing Laboratories.*

. . . Three labels to look for on fluorescent lamp ballasts, because ballasts bearing them win confidence for the lighting equipment in which they are installed.

CHICAGO TRANSFORMER
DIVISION OF ESSEX WIRE CORPORATION
3501 ADDISON STREET · CHICAGO, 18

latter categories was outlined by Mr. Condon.

Some indication of peacetime application of wartime research and developments was given at a luncheon meeting by C. G. Suits, vice-president, General Electric Co., who outlined the development of the magnetron—used to "jam" enemy radar in combat. Mr. Suits visualizes industrial application of the two kilowatt magnetron in the 1000 megacycle range, for molding of plastics; also its possible use in the home, on airlines and buses for quick warming of cooked and thawing of frozen foods.

The general concept that scientific war developments can be used in peacetime applications was supported by F. L. Hovde, president, Purdue University. Addressing a luncheon meeting, he urged that intensive research be maintained.

Some of the more spectacular predictions made at various sessions:

Television—Black and white television here to stay, little chance of obsolescence in next five to six years. Color television commercially available in next five to seven years. Stratovision (relaying of programs through high altitude aircraft repeater stations) will extend present 30 mile transmission distance to 500 or 600 miles; make possible coast-to-coast hookups.

Oil and Water Mix—Through the use of ultrasonic (sound waves with frequencies beyond range of human ear) oil and mercury and water have been made to mix; waves have been used to kill certain bacteria. This opens new field in production of catalytic agents; precipitation of dust and mist particles; food sterilization; medical therapy and diathermy.

War Material—Guided missiles will provide major means of waging future wars. Through television, operator on ground will see target as the missile "sees" it when approaching. Infrared sniperscope—an infrared beam mounted on carbine or other weapon —reflects target objects clearly on telescope even in pitch-black nights.

Air Transport—Navaglobe (for long range air navigation), teleran (air navigation and traffic control), radar, automatic radio flight control will revolutionize air travel of the future.

Atomic Power—Application in power plants possible, but no great revolutionary change should be expected; application to naval ship and submarine propulsion rather promising; out of question for automobiles and light craft. Challenge to electronic industry is to find some means of converting nuclear energy directly into electrical energy and causing particles to move in a conductor.

William Palmer, Jr., (right) owner of Palmer Electric Motor Repairs, Stamford, Connecticut, discusses some of the methods used in his new shop with Albert Newman, engineer of the Homelite Corporation, Port Chester, New York.

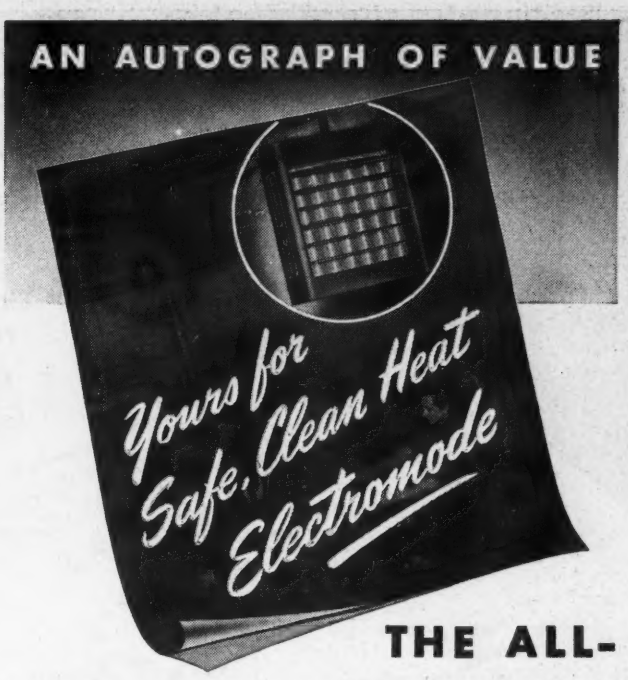
Electronic Computing — Machines now developed that will multiply one ten-digit number by another ten-digit number in about 3 milliseconds. Unit has 40 panels with 18,000 vacuum tubes and 1500 relays.

Amid all the discussions of electronic advances in communications and related fields, industrial electrical engineers felt "at home" at two sessions devoted exclusively to industrial problems. Adjustable-voltage electronic d-c motor drives are now available for applications requiring hundreds of horsepower, revealed M. M. Morack, General Electric Company.

W. H. Elliot, Cutler-Hammer, Inc., briefly reviewed some of the basic electronic circuits employed to control such a-c motors as drag-cup, shaded-pole, universal and wound rotor. Specific emphasis was placed on speed control of wound-rotor units with thyratrons or ignitrons in the primary circuit.

Contour control (following master template or pattern by a stylus or tracer) is now done by an electronic system, revealed J. Morgan, General Electric Company. Presenting a detailed discussion of the circuits and operation of this system, Mr. Morgan characterized this method as a "new electronic tool" for the machine tool industry.

A new development in the induction heating field was described in a paper by R. J. Ballard and J. L. Boyer, Westinghouse Electric Corp. This cycloinverter circuit (derived from the d-c to a-c parallel inverter circuit) converts three-phase, 60-cycle power to single-phase power at a higher frequency by means of a single conver-



THE ALL-ELECTRIC UNIT HEATER

The name Electromode on your plant Unit Heaters is assurance of economical heating available where and when it is needed without expensive piping, piping connections, insulation, and costly maintenance. Electromodes are easily and quickly installed wherever circuit wires can be run. They are also simple to remove and relocate as need determines. Factory areas, stockrooms, warehouses, isolated buildings, departments run overtime when central heating is off, are only a few places where Electromode all-electric Unit Heaters do the job better, giving greater value per dollar invested.

All hazards of fire, shock or explosion are eliminated with an Electromode installation. The sheathed heating element embedded in a one-piece finned aluminum casting is completely isolated from any external contacts; there are no exposed glowing resistors, no incandescent hot wires. All electrical energy is converted 100% into heat and no current is used when not "on". Control may be manual or automatic. Your Electrical Wholesaler can help you in selection of proper capacities. ELECTROMODE CORPORATION, Rochester 3, N.Y.

Latest Bulletin 45-UC and Heating Survey Form sent promptly upon request.

ELECTROMODE
Electric Unit Heaters

An Amazingly Convenient New Kit of

Wedge-Grip Connectors

List Price Per Kit

$4.80

50 YEARS 1896 S 1946 OF LEADERSHIP

Here's a handy kit that slips into the electrician's tool bag, and provides the right size Sherman Wedge-Grip Connector for No. 18 through No. 2 standard wire. A marvelous time saver. Eliminates those bothersome, slow soldered splices.

Kit contains 55 high quality Wedge-Grips, made of pure, hard drawn copper, with oval pointed bronze screws that wedge wires securely between V-shaped corrugations. Screws have slotted hex heads.

Order a stock of these new Wedge-Grip Kits today!

"Wedge-Grip"

The Connector of A Hundred Uses

The Wedge-Grip is a splendid connector for fixtures, junction boxes, service entrance, outlet boxes, small and large motors, electric ranges, etc.

Hundreds of Master Electricians are using this famous pressure connector in residential, commercial, and industrial work.

H. B. Sherman Mfg. Co.
Battle Creek, Michigan

Order Sherman

"WEDGE-GRIP" Kits From Your Wholesaler!

sion. With high efficiency, quiet operation, light weight, extremely low standby losses, low starting kva. demand, and adaptability for automatic operation, this new converter—together with the vacuum tube oscillator—makes it possible to supply the entire field of induction heating and melting with power from electronic equipment, it was revealed.

In the not too distant future, microwaves (1500 to 30,000 megacycles) may be used in high frequency heating, according to predictions of T. P. Kinn and J. Marcum, Westinghouse Electric Corporation. After discussing circuit elements, coaxial transmission lines and wave guides, the authors projected possible applications for the food industry and to solve drying and curing problems.

IAEL Endorses Interdependence

The theme of the eleventh annual conference of the International Association of Electrical Leagues, held in New York, October 2-4 was electrical interdependence.

Gwilym A. Price, president, Westinghouse Electric Corporation, in an address commemorating the centennial anniversary of the birth of George Westinghouse said:

"Business management has no greater task than to make clear the facts of interdependence. We cannot have national unity without unity on the local level. And the place to achieve that unity is in the individual business, in the development of confidence and trust and teamwork between manager and employee."

An example of doing what Mr. Price advocated had been given in an earlier meeting by N. J. MacDonald, Thomas & Betts Co. and J. R. Poteat, General Electric Co., in a joint presentation of the theme which resulted in endorsement of the "Declaration of Electrical Interdependence" by the conference.

These speakers were followed by L. W. Davis, NECA; C. G. Pyle, NEWA; W. J. Donald, NEMA and J. T. Coatesworth, EEI, all supporting the idea of industry cooperating and pledging support of the movement.

The electrical league directors present learned about pump house heating from S. W. Andrews, American Gas & Electric Service Corp.; the market possibilities of commercial lighting from H. H. Green, Nela Park; advances in industrial electrical applications from C. B. Stainback, Westinghouse Electric Corp.; television and its load building potentialities from A. B.

Rodner, Commonwealth Edison Co., and progress in adequate wiring from H. P. Vermilyea, John B. Pierce Foundation.

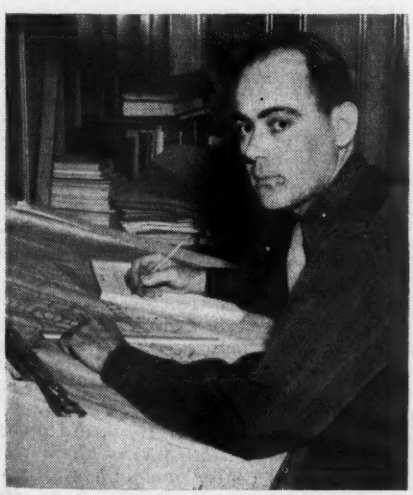
New officers elected were, president, W. G. Hills, the Electric Institute of Washington, (D.C.); vice president, S. E. Strunk, Electrical League of Cleveland; treasurer, C. H. Christine, St. Louis Electrical Board of Trade; secretary, O. C. Small, and assistant secretary, J. F. Biggi, both of NEMA.

Elected to the Board of Governors, which includes the officers, were G. W. Austen, Electric Service League of Ontario; R. B. Hubbard, Rocky Mountan Electrical League; J. Clark Chamberlain, Bureau of Radio and Electrical Appliances of San Diego County; J. A. Morrison, Electrical Association of Philadelphia; C. G. Odell, Electrical Association of Detroit; H. P. Wilson, Electric Institute of the Tri-Cities.

NHA Order Aids Veterans Housing

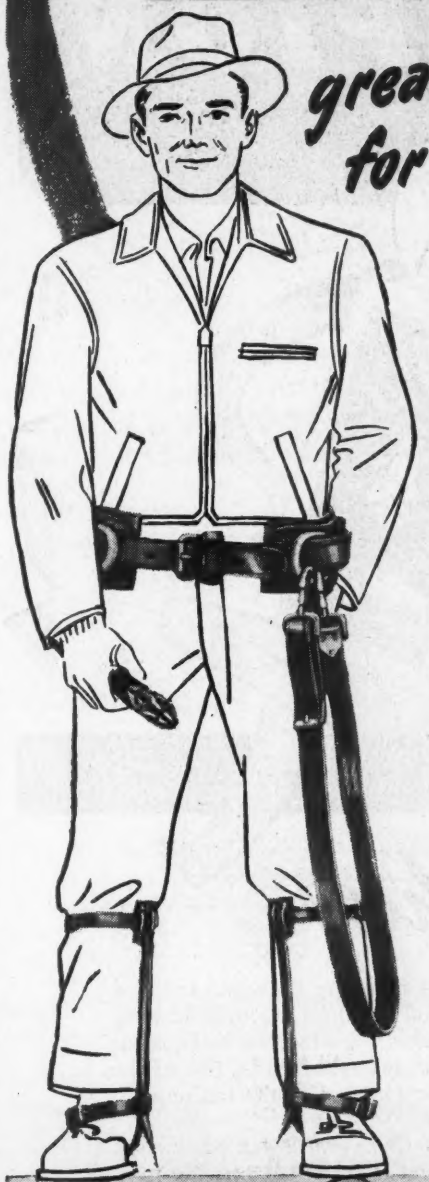
Electric utility companies and electrical contractors may qualify as top priority bidders for power equipment from wartime military installations as a result of a directive issued recently by the National Housing Agency.

The NHA order called on federal disposal agencies to offer utility equipment, as well as buildings, at such installations for sale intact to the highest bidder who certifies that he will use the materials in connection with Veterans housing. These instructions, when put in effect by the disposal agencies, would supersede the former practice



Back from the Army Air Forces as a Major, Robert Sellman—a graduate electrical engineer—takes up his old duties as engineer and estimator for Capitol Electric Company, Oklahoma City electrical contracting firm.

KLEIN-KORD..
greater safety for LINEMEN!



Klein-Kord Safety Straps, developed more than ten years ago, are today used exclusively by many of the country's largest public utilities.

Multiple plies of long staple cotton of a special weave are vulcanized in rubber. This weave permits the use of a tongue-type buckle without risk of slipping or ripping, even under severe tension and excessive loads. The red center provides a warning signal. The strap is safe for use until worn down to the center ply—"Stop when you see red."

Klein-Kord is extremely tough, flexible, and of uniform thickness and strength. It has a low conductivity, will not stretch, and is unaffected by moisture.

An improved Tool Belt of Klein-Kord is also available. This belt has found favor with linemen, and offers the quality features that have made Klein Belts the choice of linemen for generations.

Klein-Kord is an exclusive Klein development available only on equipment carrying the Klein trade-mark.

Foreign Distributor:
International Standard Electric Corp., New York

Since 1857

Write for folder giving information on Klein-Kord belts and safety straps.

Mathias KLEIN & Sons
Established 1857
Chicago, Ill., U.S.A.
3200 BELMONT AVENUE, CHICAGO 18, ILLINOIS

You can't beat a . . .
CHAMPION

Here's why . . .

1 **Champion Quality.** Champion Fluorescent and *Incandescent* Lamps are made to meet the most exacting industrial service standards—guaranteed to equal or exceed Federal Specifications—backed by one of the oldest and largest lamp producers in the business.

2 **Champion Economy.** Champion Lamp production and industrial distribution is set up to provide minimum lighting cost and lower lamp costs. Sample the service of your local Champion supply house and you'll see why.

3 **Champion Service.** Champion's trained experts are quickly available to supply unbiased recommendations on lighting and lamp applications for every industrial requirement.

Next time try the lamps bearing the Champion diamond mark.

CHAMPION LAMP WORKS

Lynn, Massachusetts

A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

of extending priorities on sales of surplus materials of this type to federal bureaus, state and local governments, and non-profit institutions.

NHA officials said that the objective of the order is to speed procurement of surplus property needed for home construction and channel it into the Veterans Housing program. Power, gas and water facilities above and below ground at surplus installations could, under the terms of the order, be sold to utilities or contractors who would reclaim the materials for use in Veterans housing, they said.

The directive provided a form certificate suggested for use by disposal agencies in establishing priorities for bidders. The form would require each bidder to guarantee the use of purchased surplus for:

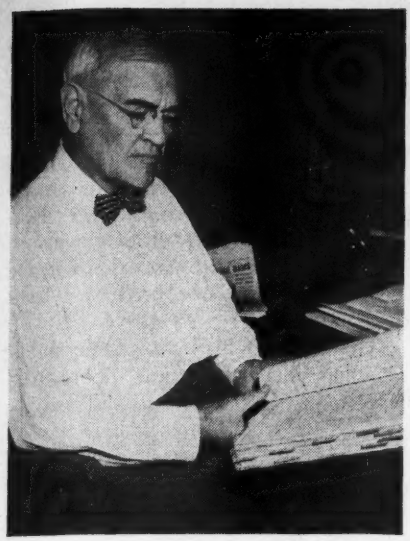
1. Construction of housing accommodations for which HH ratings have been authorized under the Veterans housing program, or 2. Construction or maintenance of utilities necessary to service priority housing.

Agencies which are handling the disposal of surplus military installations, in addition to WAA, include the Navy's District Public Works offices, War Department's Office of Land Management. WAA is reported studying the directive.

NHA and WAA have abandoned their program of ordering the dismantling of military installations.

Instructions on how equipment may be obtained under the NHA directive have been sent to builders, contractors, and HH priority holders, housing officials said.

One of the contractors who protested vigorously the REA policy against contractors who had done work for the power companies was L. B. Lewis of Cascade Electric Co., Great Falls, Mont., who with C. W. Bennett, of Billings, Mont., did many big wartime jobs. Among them was the evacuee center near Cody, Wyo., whose picture he is showing here. He rushed this job through in 59 days, erecting 650 buildings, having over 100 men working on electrical work. It meant virtually building a complete town with water supply, sewage system, hospital, etc.



Thirty-four years of service as an electrical repair specialist is the proud record of V. M. Nussbaum, senior partner of V. M. Nussbaum & Co., one of the leading motor service shops of Fort Wayne, Ind.

Prefabricated Houses

The Government is tacking profit control sweetened somewhat with a bonus incentive for mass production economies onto its contracts underwriting market guarantees for prefabricated housing under the Veterans Emergency Housing Act.

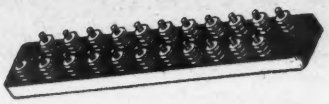
First such deal with a pre-fab producer has been negotiated by Housing Expediter Wyatt with the HomeOla (cq.) Corp. of Chicago; it calls for Government guarantee of a market for 19,400 homes to be turned out by the end of 1947—beginning at a 10-a-day rate which HomeOla has been doing on its own and running up to 30-a-day in January, 40-a-day in February to 100-a-day by June.

In exchange for the Government market guarantee, HomeOla agreed to a specified dollar profit (before taxes) on each unit it sells. In addition, the company is to get one-third of the savings in cost brought about by increased production rates. However, in computing production savings, no allowance is made for increased material and wage costs; higher prices will be allowed only if increased material and labor costs more than eat up assembly line savings. The other two-thirds of cost reductions must be passed along in reduced prices to HomeOla's customers.

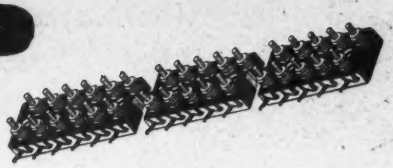
Initial costs are expected to average around $5400 for the company's story and one-half, six-room house, $6400 for its same-size single story house, owner-erected and complete except for range and refrigerator, and settlement

CHECK THESE CANNON ELECTRIC SPECIALTIES BEFORE YOU BUY

CABLE TERMINALS



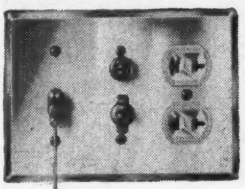
Type "R" Cable Terminals are similar to Type "SS" (at right) with the exception of the single piece construction. Entire unit is molded phenolic, 1-1/16 x 1-1/2 in. Available in 11, 16, 21 and 26 pairs.



Type "SS" Sectional Cable Terminals are designed primarily to make standard telephone terminals of any desired size above 6 pairs in additional multiples of 5 pairs, using only 3 stock sections.

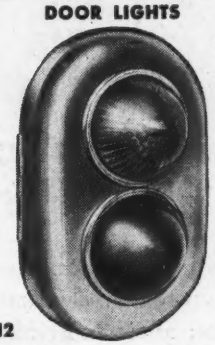
HOSPITAL SIGNAL SYSTEMS

NURSES' CALL SYSTEMS



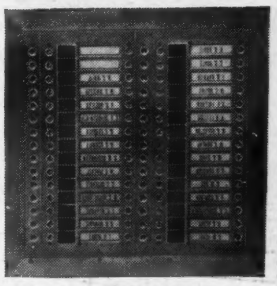
TYPE HMW4

DOOR LIGHTS



TYPE DN2

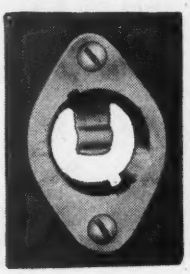
IN AND OUT REGISTERS



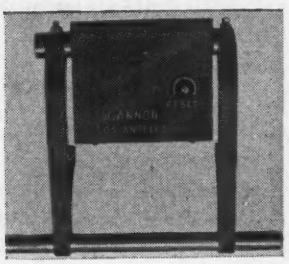
Cannon Electric offers a complete line of hospital signal equipment, and in addition to the above illustrated items, there are available: Nurses' Station Annunciator, Aisle Lights, Explosionproof and Vaporproof Switches, Nurses' Supervisory Stations, Silent Paging Systems, and Electro-Static Grounding Intercouplers for hospital operating rooms.

MISCELLANEOUS ITEMS

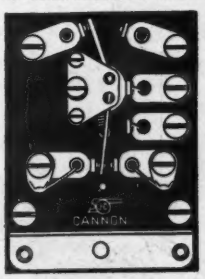
LAMP SOCKETS



FOOTRAIL ALARM SWITCH



DOUBLE ACTING RELAY



Among the various electrical specialties now available are Program Bell Transfer Panels, Holding Push Buttons, Pinch Buttons, Momentary Contact Push Buttons, Recessed Push Buttons, Fire Alarm Boxes, Code Relays, and "Knight" Lights.

Write for the C-46 Condensed Catalog and the Signal System Bulletin for further information. Address Dept. K-231.

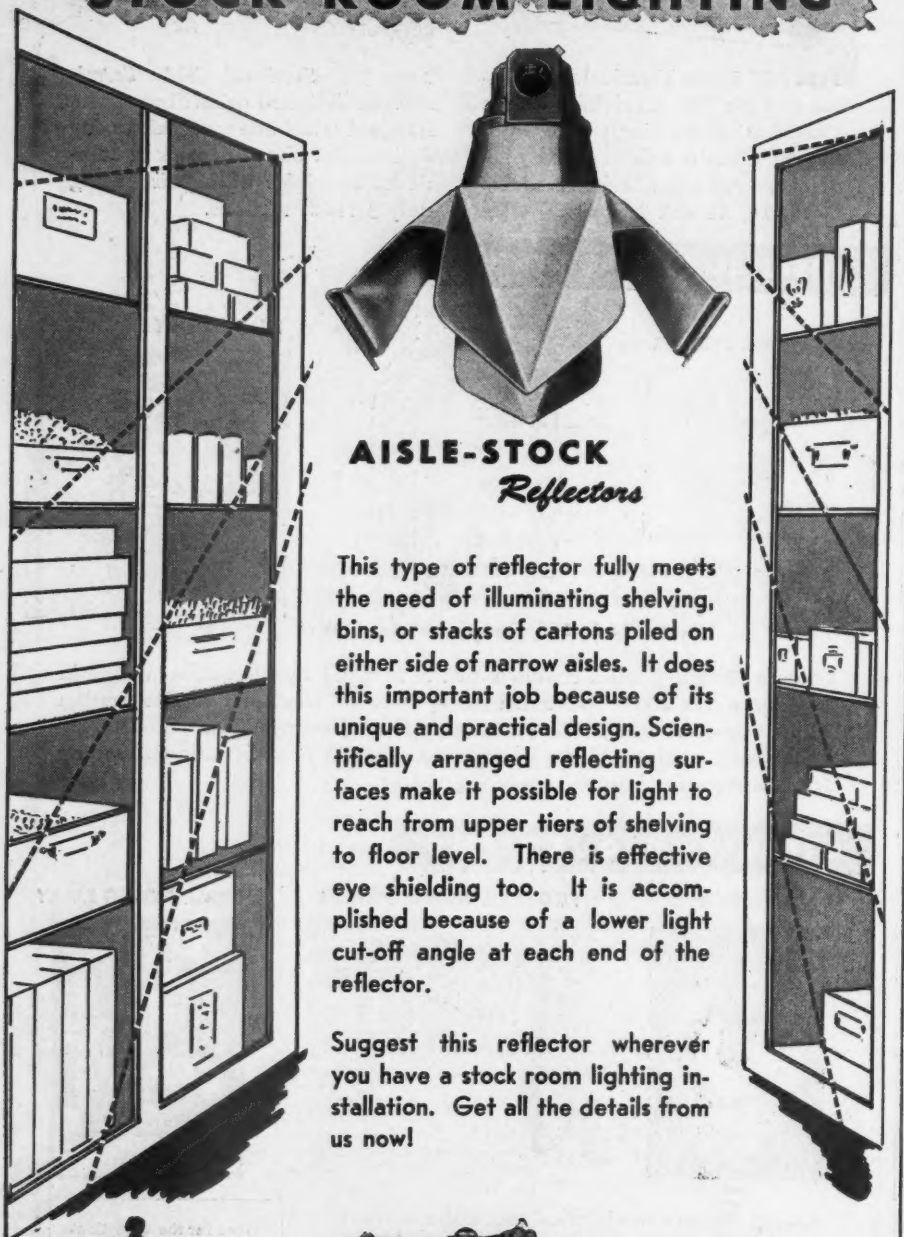
CANNON ELECTRIC DEVELOPMENT COMPANY

3209 Humboldt Street, Los Angeles 31, California

Canada & British Empire — Cannon Electric Co., Ltd., Toronto, Ontario • World Export Agents (excepting British Empire) Frazar & Hansen, 301 Clay St., San Francisco 11, Calif.

QUAD

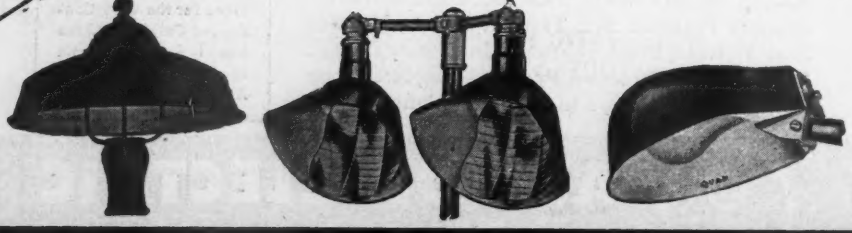
HAS THE *Modern* ANSWER TO STOCK ROOM LIGHTING



AISLE-STOCK *Reflectors*

This type of reflector fully meets the need of illuminating shelving, bins, or stacks of cartons piled on either side of narrow aisles. It does this important job because of its unique and practical design. Scientifically arranged reflecting surfaces make it possible for light to reach from upper tiers of shelving to floor level. There is effective eye shielding too. It is accomplished because of a lower light cut-off angle at each end of the reflector.

Suggest this reflector wherever you have a stock room lighting installation. Get all the details from us now!



QUADRANGLE MFG. CO.

32 S. PEORIA ST. CHICAGO 7, ILL.

and brokerage fees. This average includes $650 for ground in the story and one-half unit, $800 for ground in the single story home, and at these figures HomeOla says it has been netting about $125 per house.

Prices of the completed units are reviewable by the Government after February 1, 1947, and the company is required to furnish quarterly cost and income reports to be used as a basis for price changes.

The house consists of Douglas fir plywood panels for walls, floors, partitions, ceilings and roofs. These are erected on steel beams bolted to steel plates resting on concrete foundations. Steel trusses are used for the one-story model because of the larger ceiling and roof area. Overall dimensions of the story and one-half model are 20 by 24 feet, the one story, 24 by 32. Room sizes of both are the same—living room 20 by 12, dinette 8 by 9, kitchen 8 by 9, bath 6 by 8, bedrooms 12 by 12 and 9 by 12. As shipped from the factory, the units include, in addition to the panels and the steel plates and beams, plumbing fixtures, complete heating unit (oil, coal or gas), electric or gas hot water tank, electrical fixtures, plywood kitchen cabinets, double compartment sink. The erector provides grading and foundation, painting, glass and glazing, roof shingles, range and refrigerator.

The company now has 400 dealers in 23 states, plans to expand into all 48 states. Wood parts for the houses are to be shipped, five houses to a box car, from Tacoma, Wash., White, Wash., and Chicago. Steel parts are to be shipped from the company's Chicago plant, five units to a truck.

The second Government contract, calling for 10,000 steel houses, has been negotiated with the William H. Harman Corp. of Philadelphia. Harman will build eight types of houses of 2 and 3-bedroom size. F.O.B. factory prices will range from $2925.00 to $2965.00 for 2-bedroom models and from $3352.50 to $3672.00 for 3-bedroom models; factory price is about ½ the completed cost, not including land.

Basic design of the house is a one-story structure, rectangular shape with pitched roof. Panels of steel channels and sheets form walls, roof and partitions. Blanket type insulation is used in wall and ceiling panels. Interior wall finish is gypsum wall board. Windows are steel casement with double strength glass. The house "package" as factory-shipped includes, in addition to the "shell", enameled steel kitchen cabinets, bathroom fixtures, electric or gas range, electric, gas, or oil water heater, oil or gas heating equipment and electrical wiring. House will be dealer-erected.

Keil Heads Chicago EME's

R. H. Keil, Western Electric Co., is the newly elected president of the Electrical Maintenance Engineer's division of the Electric Association of Chicago. Assisting Keil in guiding the 1946-47 activities of the group are Paul J. Anderson (Link-Belt Co.), vice-president and R. J. McLaren who continues as secretary-treasurer.

DATES AHEAD

National Farm Electrification Conference—Hotel Sherman, Chicago, Ill., November 7-8.

International Municipal Signal Association—51st Annual meeting, McAllister Hotel, Miami, Fla., November 11-14.

George Washington Chapter IAEI—Board Room, District Bldg., Washington, D. C., November 11.

Missouri-Kansas Chapter IAEI—Hotel Leon, Hutchinson, Kansas, November 12.

North Dakota Electrical Contractors Association—Semi-annual meeting, Great Northern Hotel, Devils Lake, North Dakota, November 18-19.

National Metal Congress and Exposition—Atlantic City, N. J., November 18-22.

George Washington Chapter IAEI—Board Room, District Bldg., Washington, D. C., December 9.

American Institute of Electrical Engineers—Winter Convention, New York, N. Y., January 27-31, 1947.

Electrical Engineering Exposition—71st Regiment Armory, New York, N. Y., January 27-31.

International Heating and Ventilating Exposition—Lakeside Hall, Cleveland, Ohio, January 27-31.

Manufacturers News

G-E ANNOUNCEMENTS

Appointment of John A. Buckley, formerly of the General Electric Company's Lamp Department of Nela Park, Cleveland, as merchandise sales manager for the G-E Chemical Department has been announced. Mr. Buckley will make his headquarters at Pittsfield.

T. C. Ohart has been named health lamp sales specialist for G-E Lamp Department, Nela Park. He was formerly district engineer for the Lamp Department's Empire Sales District at Buffalo.

General Electric has purchased a plant in Fort Wayne, Ind., for the manufacture of fractional horsepower motors. A huge $20,000,000 factory for the manufacture of steam turbines and electric generators will be built at G-E's Schenectady Works.

WESTINGHOUSE APPOINTMENT

Announcement was made recently of the appointment of A. W. Larson as manager of lighting and distribution apparatus, agency and specialties sales department of the Westinghouse Electric Corporation. Mr. Larson, who has

The New Home of Lloyd PRODUCTS

Lloyd appreciates the patience and forebearance you have shown when overloaded manufacturing facilities slowed down delivery of Lloyd Flex-Loc Lamp Holders and Lloyd Automatic Starters. We are now at home in this large modern plant, where greatly increased facilities will make possible greater service to all our customers . . . service which we hope will match in quality the matchless Flex-Loc Lamp Holders and Lloyd Automatic Starters.

LLOYD POLICY INSURES QUALITY

651-F
FLEX-LOC Lamp Holder
Automatically self-adjusting. Engineered to fit ALL STANDARD spacings. POSITIVE AUTOMATIC LOCK. PERFECT ELECTRICAL CONTACT. Brass contacts grip BOTH sides of lamp pins securely.

Listed and Approved by Underwriters' Lab., Inc., and Canadian Standards Assoc., App. Division E.T.L. Test Report 314454 Available
Patented—Other patents pending

FS-40
AUTOMATIC Starter
CUTS OUT deactivated or flickering lamps. CUTS OUT current to lamp and ballast. Increases life of lamp and ballast.

Listed and Approved by Underwriters' Lab., Inc.
Certified by E.T.L., Spec. 6
Pat. Nos. 2200443-2228210

LLOYD PRODUCTS CO.
PROVIDENCE 5 RHODE ISLAND

Branch offices and Warehouse Stocks in 27 Leading Cities

40 Years' experience plus modern design is built into every R&S product.

R&S reflector contours are scientifically designed with high reflection factor providing a maximum of safe controlled light at minimum cost.

Thorough inspection and rigid factory controls insure longer life and low maintenance.

R&S explosion-proof lighting fixtures are supplied with a standardized base common to all sizes. Reflector globe assemblies of various capacities are interchangeable to suit conditions. No need to disturb mounting or electrical connections. Modern design simplifies mounting and affords a variety of conduit arrangements in one standard base. Installation costs are lower, parts fewer and ordering easier.

In hazardous areas, you can't afford to experiment. R&S explosion-proof and vaportight lighting fixtures are precision built and pass the rigid tests of Underwriters' Laboratories.

Specify R&S and be sure. Write for our 300-page catalog. You will find it valuable in planning new work and bettering existing installations to meet tomorrow's standards.

Since 1902

Please address Dept. No. A

RUSSELL & STOLL COMPANY

EXPLOSION PROOF, WATER TIGHT, INDUSTRIAL LIGHTING FIXTURES AND EQUIPMENT, AUTOMATIC LOCKING RECEPTACLE CONNECTORS

125 BARCLAY STREET · NEW YORK 7, N. Y.

been a lighting engineer for the company's northwestern district in Chicago, will make his headquarters in East Pittsburgh.

DON E. CORSON JOINS SOLAR MFG. CORP.

Appointment of Don E. Corson as manager of the Special Products Division of Solar Manufacturing Corporation, has been announced. Mr. Corson was formerly sales manager of the Power Division of Aerovox Corporation

D. E. CORSON

and sales manager of the Power Factor Division of Cornell-Dubilier Electric Corp. He is a graduate of Massachusetts Institute of Technology and is a member of the American Institute of Electrical Engineers.

DON A. DAVIS NAMED SALES MANAGER OF CANNON ELECTRIC

Don A. Davis, for several years chief engineering representative for the Cannon Electric Development Company, Los Angeles, has been appointed sales manager. He replaces William V. Brainard who resigned to form his own sales promotion service.

Mr. Davis joined Cannon Electric in 1941 and previously he had been connected with Lockheed, North American and Vultee in the electrical engineering and other departments. Before entering the aircraft field, Mr. Davis was an engineer with the International Engineering Corporation in various Asiatic countries.

WESTINGHOUSE SUPPLY CHANGES

L. G. Schrade has been named as apparatus and supplies manager of the Westinghouse Electric Supply Company's Baltimore branch.

R. D. Constable has been named branch appliance manager of the Seattle territory, succeeding R. S. Sloan

who has been promoted to district appliance manager, San Francisco.

So that he may devote his entire time to his broadcasting station in Columbus, Ohio, L. A. Pixley has resigned as district manager of the West Central District in Columbus. Mr. Pixley will, however, remain with the company in a consulting capacity until December 31. E. M. McAfee, former West Central District apparatus and supplies manager at Columbus, was appointed district manager replacing Mr. Pixley.

To serve the Brooklyn and Long Island City trading areas, WESCO has opened a supply house at 1167 Atlantic Avenue, Brooklyn, N. Y. This branch is managed by H. P. Neher, Jr., formerly on the company's headquarters staff at 40 Wall Street.

L. T. Umbach, former appliance and lamp salesman, Jamaica, will assume responsibilities as lamp supervisor for Wesco Brooklyn, Jamaica and Hempstead houses. R. E. Roberts, A & S sales at Hempstead, will become apparatus and supplies sales supervisor for the three houses.

JOHNS-MANVILLE ELECTS OFFICERS

The Board of Directors of Johns-Manville Corporation has elected Lewis H. Brown, who has been president since 1929, to be chairman of the Board and chief executive officer of the company.

R. W. Lea, who has been vice-president for finance since 1939 and executive vice-president since January, 1946, was elected president; Alvin Brown vice-president for finance and a member of the Board of Directors and John P. Syme vice-president and assistant to the chairman of the board.

SYLVANIA APPOINTMENTS

W. C. Lounsbury, Jr., formerly manager of the Lighting Department of the Lake Superior District Power Company, has joined the Lighting Division Sales Department of Sylvania Electric Products, Inc. Mr. Lounsbury will have his offices at 135 South LaSalle Street, Chicago.

Neal Jacobus of Tacoma, Wash., formerly lieutenant commander in the United States Naval Reserve, has joined the Commercial Engineering Department.

BULLDOG APPOINTMENTS

J. A. Herrmann, former field engineer of the BullDog Electric Products Co., Detroit, has recently been appointed director of engineering of that organization. Mr. Herrmann served

KEEP 'EM PROUD

OF YOUR LIGHTING JOBS...

BY USING *WATCH DOG** STARTERS THROUGHOUT

When you first install a fluorescent lighting job, everybody's proud of it, and your reputation rises.

But are you sure they'll *stay* proud of it as time goes on? You will go a long way toward being sure, if every fixture is equipped initially with G-E Watch Dog starters.

Watch Dogs keep the job completely free from blinking and flickering lamps as the lamps reach the end of their service life. A built-in "cut-out" prevents the futile attempts to start dying lamps, protecting the ballast and the starter itself.

Fluorescent lighting installations which *start out* equipped with Watch Dogs *continue* to add to your reputation as a fluorescent lighting expert. Because the user finds his maintenance costs are low, because his relamping is so simple, he's a prospect for more fluorescent lighting. And on older installations, too, a complete change-over to Watch Dogs is your best move to more user satisfaction and more fluorescent profit.

For full information on G-E Watch Dogs for 20- to 100-watt lamps, see your G-E Merchandise Distributor, or write Section G10-128 Appliance and Merchandise Department, General Electric Company, Bridgeport 2, Connecticut.

*Trade-mark Reg. U. S. Pat. Off.

GENERAL ELECTRIC

Monarch Fuse
SPRING CLIPS

FERRULE TYPE

KNIFE BLADE TYPE

Prevent Fuse Failures Due to Terminal Heating

Tighten Fuse Contacts

Monarch DOUBLE END WRENCH

Users of Monarch Renewable Fuses are provided with this ingenious wrench . . . designed to fit nuts on any and all sizes of our fuses.

MONARCH FUSES Are Available Through RECOGNIZED WHOLESALERS

Specify Monarch Fuses *for improved*

FUSErvice

Monarch RENEWABLE Fuses

MONARCH FUSE CO., LTD.

118 E. FIRST ST., JAMESTOWN, N. Y.

three years during the war as chief of the electric control section of the War Production Board; and was later sent on an extended mission to Germany for the Technical Industrial Investigating Committee.

L. H. Lipscomb has been named manager of the Chicago office of Bull-Dog. He joined the organization in 1937 and after a year as Kansas City representative, he served eight years as head of the St. Louis Office.

ALLIS-CHALMERS APPOINTMENTS

James D. Greensward has been named assistant to William C. Johnson, vice-president of the general machinery division of the Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Ned Landis, formerly a lieutenant commander in the U. S. Navy, has been named branch manager of the Syracuse, N. Y., office.

•

The formation of the **Aluminum Solder Corporation,** manufacturers and distributors of solder developed in Switzerland during the war, was announced by Hazard E. Reeves, president.

Marian W. Schwartz was elected vice president in charge of sales; Homer W. Clapper, vice president in charge of production; Werner J. Fleischmann, treasurer and Col. R. C. Marshall, 3rd, secretary. The company will maintain sales offices in the Reeves International Building, 10 East 52d Street, New York City.

•

Skilsaw, Inc., of Chicago has announced the purchase of the Forss Pneumatic Tool Company of Aurora, Ill. The Forss Company was founded in 1943 by F. P. Forss and his son, John. Both will remain with the Skilsaw organization and will be in charge of pneumatic tool manufacturing operations at the Aurora plant.

•

John L. Marsh has been placed in charge of insulated wire and cable sales for **The Okonite Company** in its newly opened sales office at 417 Merchants Bank Building, Indianapolis, Ind. Mr. Marsh, who has recently returned from service in the U. S. Navy, was formerly located in the Company's New York office.

•

The Edwin F. Guth Company of St. Louis has announced the appointment of Charles C. Munroe, Jr., as representative in the Michigan territory and the Toledo, Ohio, area. Mr. Munroe has been active in the lighting field for the past 16 years.

There is A Profit for YOU in Automatically Turning ON and OFF ELECTRIC SIGNS— LIGHTING SYSTEMS

And Dozens of Other Applications with the

2200-Watt AUTOMATIC Self-Starting TIME SWITCH Single Pole—Model 120

$12.00

Why buy LESS when you get the MOST in AUTOMATICS

Prices Subject to Usual Discount & Terms

Write for Information

AUTOMATIC Electric Manufacturing Co.

TIME SWITCHES—FLASHES

MANKATO • MINNESOTA

Superior SPECIALIZES, TOO!

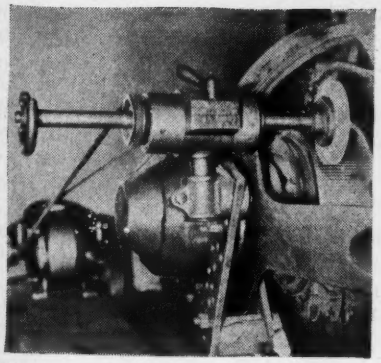
The layman never ceases to admire the fine skill of those who make and service timepieces. Specialization, if you please.... It is our job to "prescribe" the one carbon brush grade that will give you peak performance. Into every recommendation goes a 27-year acquaintance with this important subject.

SUPERIOR CARBON PRODUCTS, Inc.

9113 George Ave., Cleveand 5, O.

"Since 1919" **SUPERIOR CARBON BRUSHES**

TRUING DEVICES For Commutators and Slip Rings



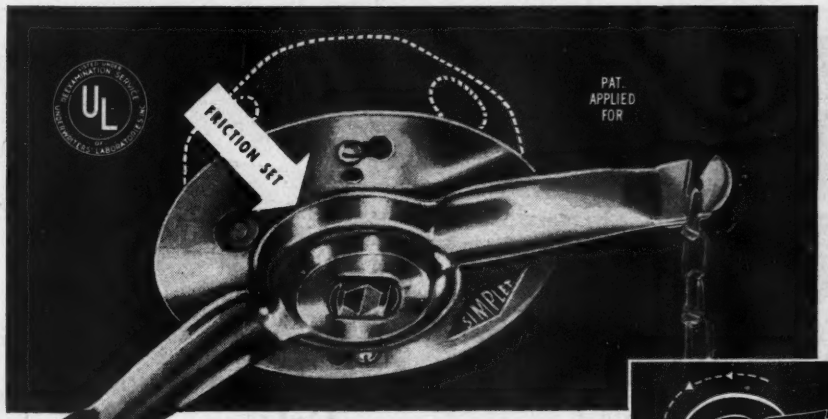
The above illustration shows a Gurney elevator motor being trued with the JORDAN COMMUTATOR TRUING DEVICE Type G machine running at normal speed while under load.

THE JORDAN COMMUTATOR TRUING DEVICE is a standard equipment for truing commutators or collector rings and should be kept in every electric plant, power house, mill or factory where generators or motors are in use. Thousands of satisfied users.

Write for Folder No. 5

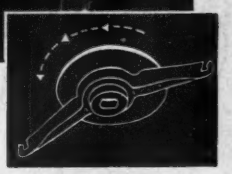
Jordan Bros., Inc.

74 Beekman St., New York, N. Y.



NEW "Friction-Set" FIXTURE HANGER . . .

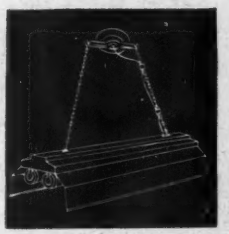
That Adjust With a Twist of the Wrist!



360° Adjustment

At last you can get a Fixture Hanger that turns to any angle after being screwed to an outlet box. Although base and receptacle remain stationary, hanger arms may be turned to align with any preconceived lighting plan. Exclusive Friction Ring firmly holds fixture in selected position. Hanger screws on to 3¼" or 4" outlet boxes, no other fastening necessary. Furnished complete with receptacle, two 5' chains, hooks and cord clips.

Friction-Set K100 . . . List Price $1.10

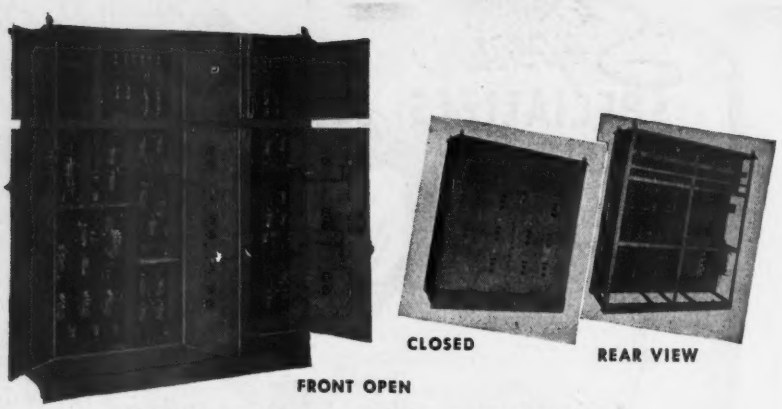


For any fixture position

SIMPLET ELECTRIC COMPANY

123 N. Sangamon Street • Chicago 7, Illinois

112 Charlton Street • New York 14, N.Y.



FRONT OPEN

CLOSED

REAR VIEW

WITH CENTRALIZED CONTROL
ONE MAN IN ONE PLACE CONTROLS EVERYTHING

Convenience and accessibility of controls are but two of the many potent arguments for centralized control. Here are a few of the advantages:—

SAFETY of dead front enclosure with operation of all mechanisms from the front offers greatest protection to your operator.

SIMPLICITY of installation and wiring results in reduced costs.

SPACE SAVING with the single enclosure is accomplished. Frameworks and wall supports are not needed.

ENGINEERED CONTROL to meet your own requirements at little or nothing above the final cost of individual control units.

These are but a few of the reasons why alert engineers are specifying centralized control for modern plant installations.

Let us show you the benefits. A Ward Leonard engineer will gladly help you to select a centralized control to meet your exact needs.

WARD LEONARD
RELAYS • RESISTORS • RHEOSTATS
Electric control devices since 1892

WARD LEONARD ELECTRIC COMPANY
28 SOUTH STREET, MOUNT VERNON, N. Y. • OFFICES IN PRINCIPAL CITIES

with

***COLOVOLT**

Cold Cathode—Low Voltage Lighting

and here's what they say:

"Lower maintenance cost—longer maintenance of a given foot-candle level—greater dependability because of guarantee (One year of light guaranteed, except for failure due to breakage)—instantaneous starting—no flickering—continuous line lighting." These extra advantages are available to commercial and industrial users of light when installations are made with COLOVOLT Cold Cathode, Low Voltage Fluorescent Lamps and Fixtures.

Write for illustrated material and technical data.

* Trade Mark Registered U. S. Patent Office

GENERAL LUMINESCENT CORPORATION
672 S. FEDERAL STREET CHICAGO 5, ILLINOIS

The Torq Electric Mfg. Company and the Torq Properties Inc. have been incorporated under the name **The Torq Electric Corporation.** The officers of the company are Fred Polster, president, Joseph E. Greenhut, vice-president and treasurer, and Harold Polster, secretary.

•

Industrial electronic tubes, laboratory equipment and industrial and electronic devices for communication applications, manufactured by **Sylvania Electric Products, Inc.,** Electronics Division, will be distributed in Canada through **Stromberg-Carlson, Ltd.**

•

Robert L. Gill, Jr., has been appointed Pacific Coast Manager of The **Bryant Electric Company.** He succeeds F. C. Scharr, who resigned. He will make his headquarters at 3310 Leonis Boulevard, Los Angeles, Calif.

•

The **Standard Transformer Company** of Warren, Ohio, announces the appointment of the Southwest Sales and Service Company, Shreveport, La., as its representative for the States of Louisiana, Mississippi and Arkansas.

•

Robert P. Smith, formerly Florida manager of Westinghouse Electric Supply Company, has opened a manufacturers agency business in Jacksonville, Fla., at 304 Roberts Building.

•

Pennsylvania Transformer Company has acquired from War Assets Administration, buildings No. 20 and 25 of the Aluminum Forging Plant in Canonsburg, Pa. The company will maintain its offices at Pittsburgh, Pa.

•

R. J. Brask has joined the **H. G. Anschuetz Organization** in Philadelphia as a specialist on the Penn-Union Co. line.

•

Graybar Electric Company has named John E. Fontaine as manager at Houston and Lynn A. Haley as manager at Beaumont, Texas.

•

On November 1, the **Worner Electronic Devices** of Chicago moved into their new plant at Rankin, Ill.

•

Safeway Heat Elements, Inc., Middletown, Conn., has named Charles J. Hall as vice-president in charge of engineering.

NALCO
Dritherm
INFRA-RED
LAMPS

For Controlled Radiant Heating

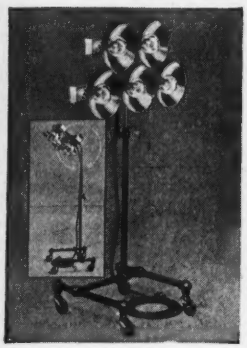


Illustration shows popular 5 - lamp portable unit.

No matter how small or how large your installation job. Nalco - Dritherm Infra - Red Lamps will supply speedy, thorough, penetrating heat with economy, because Nalco Radiant Heat is easily controlled — starts penetrating the instant it is switched on — no warming up period.

The great flexibility of Nalco Dritherm Infra-Red Lamps makes them suitable for every kind of operation that requires radiant heat for drying, curing, baking, and dehydrating. Available singly, in pairs, in groups, or in banks. Nationally advertised.

At your Electrical Wholesaler

NORTH AMERICAN
Electric Lamp Co.

1044 Tyler St. St. Louis 6, Mo.

NOW in New Plastic Protective Case!
POWER CUTTER KIT
with a cutting range of 5/8" to 2 1/2"

Only $7.85 Complete

Two Bruno Adjustable Hole Cutters in one convenient, permanent case that keeps tools clean and blades sharp. High speed steel blade cuts clean, fast holes in metal, plastics, wood. Quickly adjustable and easily sharpened... Designed by tool engineers to operate efficiently in bench drill, drill press, or portable drill.

Ask your jobber, or write Dept. EC-11

POWER CUTTER KIT CONTAINS

MODEL	SHANK SIZE	EXPANSION	PRICE
100	1/4" st. shank	5/8"—1 1/2"	$3.00
101	3/8" st. shank	1"—2 1/2"	$5.00
790 KIT		5/8"—2 1/2"	$8.00*

*Fair Trade Minimum $7.85

BRUNO TOOLS
9330 Santa Monica Blvd.
Beverly Hills, Calif.

Electricity

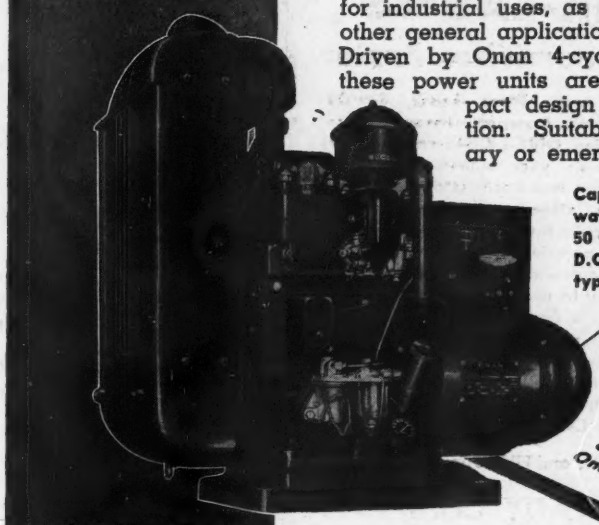
Onan ELECTRIC PLANTS

FOR ANY JOB—ANYWHERE

ONAN ELECTRIC GENERATING PLANTS supply reliable, economical electric service for industrial uses, as well as for scores of other general applications.

Driven by Onan 4-cycle gasoline engines, these power units are of single-unit, compact design and sturdy construction. Suitable for mobile, stationary or emergency service.

Capacity range: 350 to 35,000 watts; 115 to 660 volts A.C., 50 to 800 cycles; 6 to 500 volts D.C.; combination A.C.—D.C. types.



Write For Folder 690 describing complete Onan Line

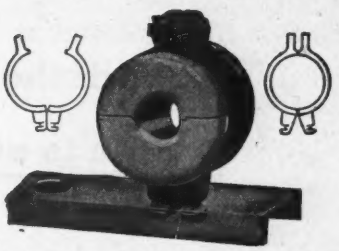
Model shown is from W2C series: 2000 to 3500 watts, powered by Onan two-cylinder, water-cooled engine.

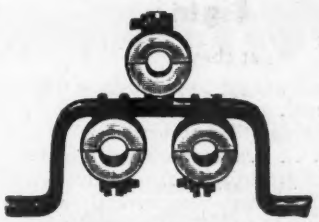
D. W. ONAN & SONS

2122 Royalston Ave. Minneapolis 5, Minn.

"EFFICIENCY" DEVICES FOR CONDUIT AND CABLE SUSPENSION

EFFICIENCY NESTED CONDUCTOR RACKS





Nested Conductor Racks available for Cable diameter from 5/16" to 2⅜".

- Simplicity is keynoted in the design of the EFFICIENCY bushing rack. Note that a single bolt supports the bushing and at the same time clamps the bushing support to the rack. Each fitting is a separate unit . . . permits the installation of each cable independently.

The EFFICIENCY rack is constructed of standard rolled steel channel—sizes according to size of bushings and number of mountings for each rack. Bushing supports are malleable iron. For A.C. service a brass half is furnished. Bushings are glazed porcelain, extra large and heavy.

Complete information on all EFFICIENCY Electrical Devices is available. Write today for your copy of Catalog No. 38A.

Efficiency ELECTRIC AND MANUFACTURING CO.

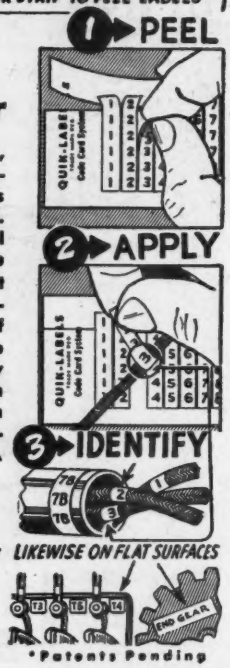
Removable Self-Starter Strip exposes ends of Labels for you to peel!
DON'T PICK. USE SELF-STARTER STRIP TO PEEL LABELS
QUIK-LABEL
FREE SAMPLES
DON'T PICK. USE SELF-STARTER STRIP TO PEEL LABELS

QUIK-LABELS

Mark your wires Faster

QUIK-LABELS code Wires, Leads, Circuits, Relays, Parts, etc. faster and cheaper. ● Pre-cut to exact size, QUIK-LABELS come in rows on handy Cards, stick without moistening. ● Replace slow and costly string tags, roll tapes, decals, stencils, metal tabs, etc. ● Coated with clear insulating varnish to resist dirt, grease, abrasion. ● Removable *Self-Starter Strip automatically exposes ends of Labels for you to grasp instantly — no more finger-picking. ● Cost less to buy-and-apply than all other markers. ● Maintenance men carry Cards to the job. ● QUIK-LABEL Bench Dispenser holds Cards for production operators to code with both hands free. ● 275 NEMA Markings and Colors in stock.

Write for Folder and FREE Sample Cards.



W. H. BRADY COMPANY

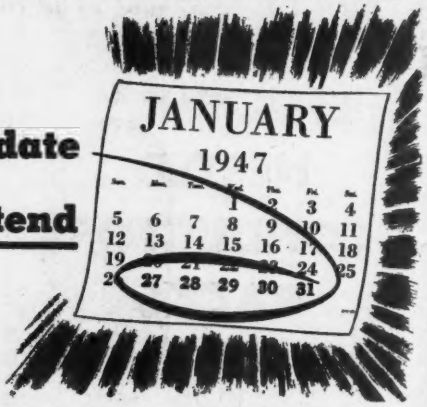
Mfgs. of Self-Sticking Tape Products

Established 1914

801 N. 3rd St., Milwaukee 3, Wisconsin
***Factory:* Chippewa Falls, Wisconsin**

*Patents Pending

The Electrical Show You've Wanted for Years



Electrical engineers and operating men have wanted an exposition like this for years to see and compare—under one roof, in minimum time—the latest materials, equipment and practices for the generation, transmission, distribution and use of electric energy. This is it! . . . . the Electrical Engineering Exposition . . . . comes when there are probably more newly revealed electrical developments than ever before . . . runs concurrently with the Winter Convention of A.I.E.E.—and near-by.

Plan now to attend. See over a hundred informative, technically staffed exhibits. Post yourself on latest developments that will be helpful in your business . . . make you more valuable to your company. Reserve the dates now. Admission by registration only.

ELECTRICAL ENGINEERING EXPOSITION

71st Regiment Armory • NEW YORK • JANUARY 27-31, 1947

To be held concurrently with Winter Convention of American Institute of Electrical Engineers

ELECTRONIC SPEED CONTROL OF WOUND ROTOR MOTORS [FROM PAGE 55]

be coupled directly to the shaft of the wound-rotor motor to help drive the mechanical load, or may be used to drive an a-c generator which returns to the supply system the power recovered from the induction motor secondary. In either case, speed adjustment is obtained through control of the field of the d-c machine. Figure 1-B shows experimental speed-torque curves for a 25 hp., wound-rotor motor.

Speed reduction obtained with this type of drive is a function of the ratio of the rating of the d-c motor to the a-c motor. Approximate relationships for the case of constant power are as follows:

With d-c motor mechanically coupled to a-c drive

$$M = A - 1$$

With d-c motor driving an auxiliary m-g set

$$M = \frac{A - 1}{A}$$

Where:

M = d-c to a-c motor ratio

A = maximum to minimum speed ratio

By employing grid-controlled rectifier tubes, the speed ranges may be extended over that secured with plain rectifiers—but with a sacrifice of torque as indicated in Fig. 1-C.

Electronic Unbalanced Primary Control

In numerous applications, such as paper bag making machinery, graphic arts equipment, and newspaper printing press drives, inching and threading operations must be performed at speeds from two to 25 percent rated speed. This is usually accomplished by employing an auxiliary constant speed motor operating through a slow motion gearing and an over-traveling clutch. A fluttering contactor in the secondary circuit provides a "take-off" speed of about 15 percent of rated speed. Electronics offers a means of obtaining these low speeds with increased flexibility, simpler mechanical equipment and quieter operation.

In Figure 2, curve A shows the speed-torque curve of a wound-rotor motor with resistance in the secondary circuit equal to approximately 0.80 $\frac{E}{I_{ph}}$ and with a balanced three-phase primary circuit. Curve B shows what

DON'T GUESS... TEST!
SAVE TIME. USE THESE HANDY SERVICE INSTRUMENTS

MEGOHMER
INSULATION TESTERS

New Crankless Types, 500 Volts, 0-200 Megohms with additional ohm scales. Check Motor Insulation. Prevent Breakdowns. Check wires and cables.

Bulletins 435-E & 445-E.

TACHOMETERS
HAND TYPES
All speeds up to 48,000 RPM

Single and Multiple ranges. Accurate and Dependable.

Write for Bulletin 1046-E.

TONG TEST AMMETERS

For quick load checks on AC and DC. Not just AC. Greatest Time Saver.

Write for Bulletin No. 400-E

HERMAN H. STICHT CO., INC.
27 PARK PLACE NEW YORK 7, N. Y.

RELIANCE AUTOMATIC TIME SWITCHES
Model "W"

Completely automatic . . . extremely simple, compact, economical . . . three types cover practically every requirement . . .

ASTRONOMIC TIME SWITCH

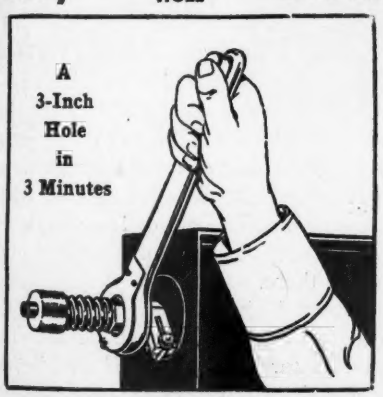
● The Model "W" Astronomic types are particularly popular for advertising illumination. The "on" operation changes daily to correspond with local sunset time, eliminating the necessity of re-setting the dial as the days become longer or shorter.

AMERICA'S RELIABLE 24 hour-a-day GUARDIANS

RELIANCE Time Switches have proved their dependability. They give complete and reliable service under many varied conditions—a factor of paramount importance when constant good service is essential. Send for catalog and price sheets for complete details.

RELIANCE AUTOMATIC LIGHTING CO.
1907 MEAD STREET RACINE, WISCONSIN

"Jiffy" ADJUSTABLE HOLE CUTTER



CUTS HOLES FAST

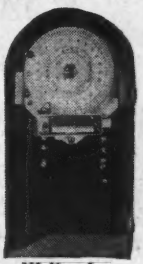
"JIFFY" CUTTER makes quick easy work of cutting operation. Cuts holes from ¾" to 6" in diameter through any gauge sheet metal, cast iron or steel up to ¾" thick. Will also cut slate, marble, bakelite and other fiber materials. A timesaver on switch-box jobs that usually require extra holes where there are no knock-outs. Compact, light weight. Useful in switchboard building, industrial plants, sheet metal shops. Ratchet wrench and spring pressure permits easy operation in corners, on ceiling or in any cramped position.

The Jiffy Line

SOLD BY YOUR JOBBER
Write for "Jiffy" folder EC for full details.

CLYDE W. LINT
Room 301, 100 So. Jefferson St.
CHICAGO 6, ILLINOIS

TORK CLOCKS



For all types of electrical switching and time control. Tork Time Clocks will control operations efficiently and automatically. Self-starting, all-electric. A variety of models; for minutes, hours, days, or weeks. Plain or Astronomic Dials.

Price from $13.00 list.

Write for Bulletins

OTHER TORK PRODUCTS

TORK 'PERSONAL': Portable plug-in switch for home or office. Capacity 660 Watts. All standard features.

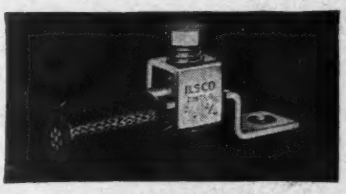
TORK TYMOTHERM: For automatic and efficient heating control; 'steady,' 'intermittent,' and 'off' control. For oil, coal, or gas.

WEEKLY CALENDAR WHEEL: Optional feature on all standard models provides for automatically skipping one or more days each week.

POULTRY LIGHTING CLOCKS: Standard models for automatic Bright-Dim lighting equipment control for poultry houses.

RELAYS AND CONTACTORS • SPRING-DRIVEN MODELS • CAM OPERATED TIMERS • CLOCKS FOR SPORTS AND GAMES • SELECTOR WHEELS • TIME DELAY CIRCUITS • FREEZALARM FOR REFRIGERATION PROTECTION

TORK CLOCK CO.
MOUNT VERNON NEW YORK



ILSCO ELECTRICAL CONNECTORS

They've Got Everything!

SIMPLICITY
No special tools.

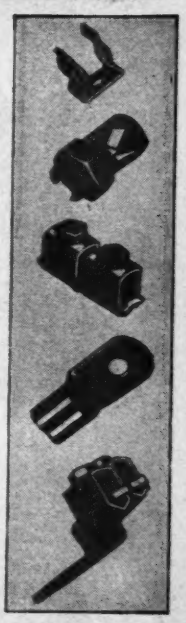
CERTAINTY
Installed for keeps.

APPROVED
Underwriters' and Canadian

STRENGTH
Six times more than required

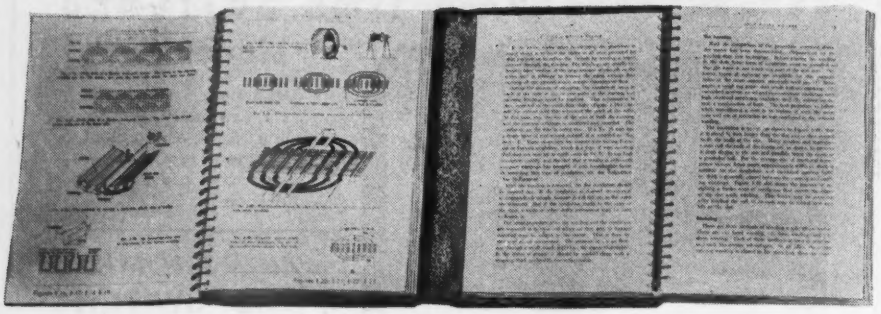
ACCEPTANCE
Used everywhere!

Write for 48-Page Illustrated Catalog



ILSCO COPPER TUBE & PRODUCTS, Inc.

A Pair of Pliers . . . A Screw Driver and . . .



THIS BOOK

is all you need to repair, rewind, connect and assemble an electric motor

Split-phase, capacitor, repulsion-induction, polyphase, Direct current—All are covered in language and diagrams anyone can understand.

The student—the apprentice—the mechanic—the foreman and the engineer will save hours of experimenting, testing, tracing connections if this book is available.

The duo-spiral binding makes both text and illustrations visible at the same time and the complete index permits quick finding of the subject desired.

This book of 570 pages and 900 illustrations is a must for the mechanic who wants to know the right way, the quickest way to rewind and repair electric motors.

Electric Motor Repair $5.00+Postage

READING ELECTRIC COMPANY, Inc., 200 William St., New York 8, N. Y.

Leading manufacturers of lighting fixtures use and recommend "ADVANCE" Ballasts for QUIET operation, high efficiency performance, low replacement cost and long life. "ADVANCE" Ballasts are streamlined for easy installation in fixtures and are approved by Underwriters Laboratories.

ADVANCE TRANSFORMER CO.

1124 W. CATALPA AVE., CHICAGO 40, ILL., U. S. A.—CABLE ADDRESS: ADTRANS

the single-phase speed-torque curve would be if one of the primary terminals were disconnected. Assume now that a load having the characteristic of Curve C is to be driven at ten percent of rated speed. With a balanced primary connection, the load would be accelerated to point P, the intersection of curves A and C, and would run at 40 percent of rated speed. With the single-phase connection, the drive would not accelerate since the motor has zero torque at zero speed.

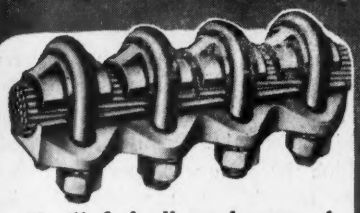
If, however, the balanced three-phase primary connection were applied only until the drive had risen to ten percent speed at point Q and then the balanced condition and the single-phase condition were applied alternately at the proper rate, the speed could be maintained at the desired ten percent value. This is made possible through a combination of gaseous electron tubes, a tachometer generator, and a suitable electronic control circuit.

A pair of inverse-parallel-connected thyratrons or ignitrons in one of the supply lines to the primary of the motor perform the required three-phase to single-phase switching operations. The ratio between the duration of the three-phase and single-phase operations each half-cycle depends upon the relation between the instantaneous speed of the drive as indicated by the tachometer generated voltage and the preset speed as indicated by a reference voltage. These voltages are compared and their amplified difference is employed to alter the phase displacement between the grid and anode voltages of the thyratrons to provide more or less conduction with correspondingly more or less torque to bring the drive to the preset speed and hold it there.

Essential circuits for complete control of a 5 to 10 horsepower wound-rotor motor by this method are shown in the elementary diagrams of Figure 3. Two thyratrons are connected in inverse-parallel in the line connection to terminal T3 of the motor when contactor LS is closed. This contactor also connects a fixed amount of resistance into the secondary circuit so that, with the tubes fully conducting, a stalled torque of about 125 percent of rated torque is available. The amount of conduction of the thyratrons is determined by the phase displacement of the grid voltage (as supplied by transformer 3PT) with respect to the anode voltage.

The electronic control circuit is furnished with a regulated d-c supply by transformer 5PT, the 5Y3-GT full-

Conductor Fittings



You'll find *all* good types of Straight and Parallel Connectors in the *Complete* line—all sizes: Bolted straight connectors, screw type, various split sleeve types, shrink fit, universal clamps, E-Z connectors with yoke and nut, etc.

Penn-Union also makes the *complete* line of Service Connectors, Tees, Cable Taps, Grounding Clamps, Lugs, etc. Leading users have found that *"Penn-Union" on a fitting is their best guarantee of unfailing service.*

PENN-UNION ELECTRIC CORP.
ERIE, PA.

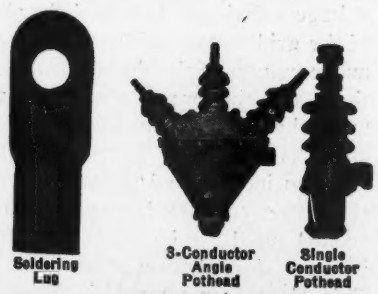
PENN-UNION

ELECTRICAL SPECIALTIES

RMC

FOR HEAVY INDUSTRIAL SERVICE

FROM STOCK



Write for a complete selection of RUSGREEN bulletins

ENDULATORS (POTHEADS) ALL SIZES • ALL SHAPES • ALL VOLTAGES • ALL TYPES • BUS SUPPORTS • SPLICING KITS AND MATERIALS • INSULATING COMPOUNDS

★ ★ ★

RUSGREEN MFG. CO.
14260 Birwood Avenue • Detroit, Mich.

INCREASING YOUR HOLD ON YOUR JOB

and giving yourself a chance for advancement

Few men deliberately plan to work persistently on self-improvement. If progress comes naturally, they are happy; if it does not, they either worry or they entirely ignore the situation.

Yet it is possible to pay attention to self-improvement with considerable hope of success. A noticeable degree of advancement is practically *assured* to anyone who will make an intelligent and persistent effort.

Thousands of men have proved this for themselves, with the use of

The CROFT Library of Practical Electricity

7 Volumes, 2906 pages
1948 how-to-do-it illustrations

● The Croft Library is a complete electrical educator. Founded on practice—on 20 years of shirt-sleeve experience—on work as it is actually done. Jammed from cover to cover with the kind of hardheaded facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough, that it is the daily guide of 59,000 highly paid electrical workers and engineers.

● Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—electrical machinery of every type—illumination in its every phase—the most improved methods of lighting—lamps and lamp effects, etc.—how to do a complete job, from planning it, to completion.

NO MONEY DOWN
EASY PAYMENTS
10 DAYS' FREE EXAMINATION

Fill in and mail the coupon below and we will send you the entire set of seven volumes for ten days examination on approval. We will take all the risk—you assume no obligation. If you decide to keep the books, send $3.50 in ten days and the balance at the rate of $4.00 a month.

Send this* McGRAW-HILL *coupon

McGRAW-HILL BOOK CO.
330 W. 42nd St., New York 18, N. Y.

You may send me the seven volumes of the Croft Library of Practical Electricity for 10 days' examination. I agree to return the books, postpaid, in ten days or remit $3.50 then and $4.00 a month until the special price of $19.50 has been paid.
(To insure prompt shipment, write plainly and fill in all lines.)

Name .....

Home Address .....

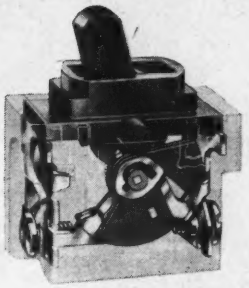
City and State .....

Position .....

Company .....EC. 11-46

For Canadian price write Embassy Book Co., 12 Richmond St. E., Toronto 1.

P&S GIVES YOU YOUR MONEY'S WORTH



A STURDY "SPECIFICATION" SWITCH

Totally enclosed—All Bakelite body—Large binding screws — Precision-built mechanism incorporating the latest developments for handling Type C lamp loads — A real T-rated switch.

Note positive arc-snuffing action — yoke which oscillates in circular bearings to minimize friction — pre-loaded contacts which eliminate vibration and arcing — your assurance of long life — positive performance.

Plus the added advantage of space-saving size, permitting assembly of switches, outlets, pilots in units of two or three to a gang — A saving on boxes and on plates.

FIGURE ON WIRING THAT NEXT JOB . . .

The P&S-DESPARD WAY

PASS & SEYMOUR, INC.
Syracuse 9, N. Y.

From Stock Nearest You

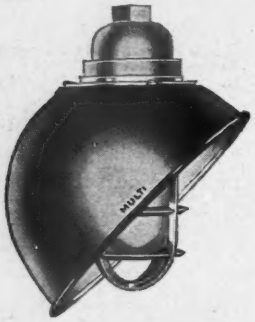
Boston - Chicago - Los Angeles - Minneapolis - Mobile, Ala.
Newark, N. J. - Philadelphia - Portland, Ore. - San Francisco
Seattle, Wash.

—another way to help serve you.

THE TOLEDO STANDARD COMMUTATOR CO.

2242 SMEAD AVE. TOLEDO 6, OHIO

3 FACTORIES
to serve you
TOLEDO · HOMER · HILLSDALE



MULTI
REFLECTORS

A COMPLETE LINE FOR ALL NEEDS

We can supply all your commercial, industrial, and residential lighting needs . . . install the best possible lighting for your customers and make every lighting job pay—guarantee every lighting job you install with MULTI units. This is the modern method for taking good care of your customers and relieving yourself of after worries.

MULTI
ELECTRICAL MANUFACTURING CO.
4223 W. Lake St., CHICAGO 24, ILL.

SYNTRON

DEPENDABLE
ELECTRIC HAMMERS

DRILL— CUT and CHANNEL in Concrete and Masonry

Easier — Faster — Cheaper

3600 powerful blows per minute
Light socket operation

Write for Catalog #464

SYNTRON CO.
690 LEXINGTON HOMER CITY, PA.

wave rectifier tube, filter capacitors 1C, load resistor IC, and the voltage regulator tube. Since a constant voltage exists across the potential divider AB, an unvarying reference voltage may be selected by adjustment of the movable contact on this unit. This potential determines the speed at which the drive will operate. Between this movable contact and the input grid of the twin-triode is interposed the output voltage of a tachometer generator in opposition to that set up on the speed control potential divider.

The tachometer generator will have no output at standstill, hence the potential obtained from the threading speed control unit will be imposed through current limiting resistor MN upon the input grid of the twin-triode, causing full conduction. The resulting drop across resistor CD will bias the second triode to cut-off, so that with no appreciable voltage drop across resistor CE, the third triode will be fully conducting. The output of the latter tube will fully energize the d-c winding of saturable reactor 4PT. This will so diminish the impedance of the a-c windings of this reactor in the phase shift circuit (consisting of these windings, resistor RS, the secondary of transformer 1PT, and the primary of grid transformer 3PT) that the grid voltages of the thyratrons will be brought practically in phase with the anode voltages and the thyratrons will become fully conducting upon operation of the *Thread* button and energization of contactors M and LS.

The motor will accelerate with 125 percent of torque. As the preset speed is approached, the voltage generated by the tachometer bucks the reference voltage sufficiently to retard the phase of the grid voltage with respect to the anode voltage of the thyratrons. From there on, the preset speed is maintained by the tubes conducting only as much as necessary.

When inching and threading operations are completed, acceleration to normal speed can be secured by pressing the *Run* button (see Fig. 3). This closes contactor HS, drops out contactor LS, shorting out the thyratron circuit so the motor operates with a balanced primary under standard secondary resistance control.

Commercially available thyratron tubes will handle line currents of motors up to about 10 hp., 220-volts or 20 hp., 440-volts. Beyond this and up to 250 hp, 220-volts or 500 hp., 440-volts, ignitron tubes may be used. Field installations of 5-, 25-, and 150-horsepower have been made to date.

WHERE TO BUY

Equipment, Materials and Supplies for Electrical Construction — Maintenance — Repairs

DRILL CONCRETE THE EASY WAY

WODACK "DO-ALL" ELECTRIC HAMMER AND DRILL

Saves time and labor installing expansion anchors. Two motions—reciprocal for hammer drilling—rotary for twist drilling. Drills masonry to 1⅝" dia., metal ⅝". Easy to maintain. Universal motor, runs direct from lamp socket. Weighs 15 lbs. Star drills in 17 diameters. Also chisels, bull points, etc. Ask for Bulletin 442 EC.

Wodack Electric Tool Corporation
4627 W. Huron St. Chicago 44, Ill.
Telephone AUstin 9866

AT IT SINCE '88 — ALLEN — 500

FLUX

For

SODERING
Silver Sodering
WELDING

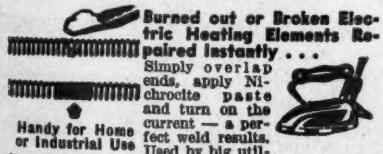
L. B. ALLEN CO., Inc. 6715 BRYN MAWR AVE CHICAGO 31 ILLINOIS

LAMP ANNUNCIATORS

Kirkland Bulls-I-Units are ideal for building lamp annunciators. Just provide the proper size holes in the panel, then insert the Kirkland units and lock into place. Assembly is then ready for installation. Connect incoming wires and place in service. *WRITE FOR CATALOGUE.*

THE H. R. KIRKLAND COMPANY
811 KING STREET MORRISTOWN, N. J.

NICHROCITE SAVES MANY ELECTRIC APPLIANCES!

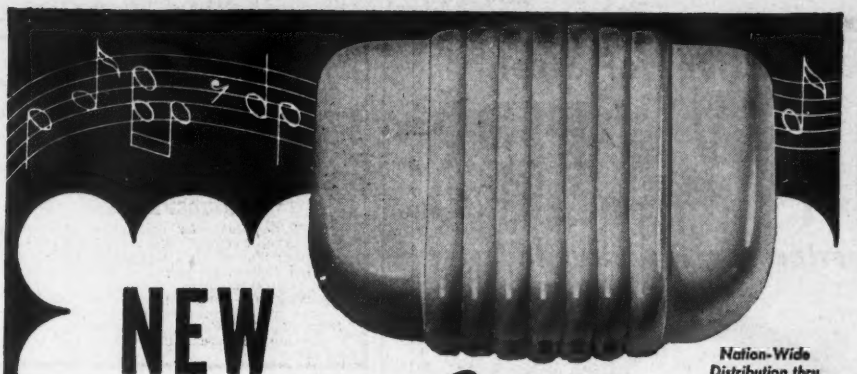


Burned out or Broken Electric Heating Elements Repaired Instantly . . . Simply overlap ends, apply Nichrocite paste and turn on the current — a perfect weld results. Used by big utility companies and repair shops. Just the thing for that broken or burned out heating element in your electric iron, stove, toaster or heater. Easy to use in those hard-to-get-at places. Does the job in a jiffy. Trial order, $1; 4 oz. $2.50; 1 lb. $8.00.

Handy for Home or Industrial Use

ARROWHEAD SALES & DISTRIBUTING CO.
420-B Phoenix Bldg. Minneapolis, Minn.

NEW *Mell-o-Chime* MELODEON



Nation-Wide Distribution thru Leading Wholesalers

UTILITY MODEL ELECTRIC DOOR CHIME

A new, *happy note* for kitchen, hall, study, or any room in the home. Expertly designed for beauty, compactness, utility—and moderately priced. Precision engineering assures fine tonal quality.

The new MELODEON is self-contained. Sounds two musical notes for front door, one note for rear door. Graceful, fluted, metal cover, in rich Ivory Baked Enamel. Backed by *Mell-o-Chime* cooperation!

AMERICA'S FINEST ELECTRIC DOOR CHIMES

National Sales Representatives: Hatheway & Co., 75 Montgomery St., Jersey City, N. J.

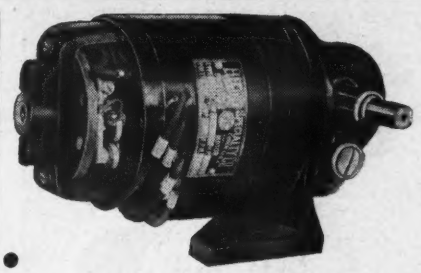
MELL-O-CHIME AND SIGNAL CORP.
119 SOUTH JEFFERSON ST. • CHICAGO 6, ILLINOIS

What Makes a Mailing Click?

Advertising men agree . . . the list is more than half the story. McGraw-Hill Mailing Lists, used by leading manufacturers and industrial service organizations, direct your advertising and sales promotional efforts to key purchasing power.

In view of present day difficulties in maintaining your own mailing lists, this efficient personalized service is particularly important in securing the comprehensive market coverage you need and want. Investigate today.

McGraw-Hill Publishing Co., Inc.
DIRECT MAIL DIVISION
330 West 42nd Street, New York, 18, N. Y.



REVERSIBLE TYPE

GEARED MOTOR

A Specially Built geared motor. Excellent for automatic Toasters, Slow Motion platforms and Display Units . . . This motor Mfg. by Electric Spec. Co. And is fully guaranteed.

- BRONZE HOUSING
- RIGHT ANGLE SHAFT, ANY POSITION
- WORKING 23 RPM
- 1/40 H.P.
- 110 V. A.C., D.C.

Immediate Delivery !

LOTS OF 30 $15 each
SINGLE UNITS $17.50

Write, wire or phone

Benjamin's for Motors
130 CLINTON STREET
BROOKLYN N Y
MAIN 4-5181

Millions of Steel

JIFFY CLIPS

Serving the Electrical Industry

Specify

MINERALLAC

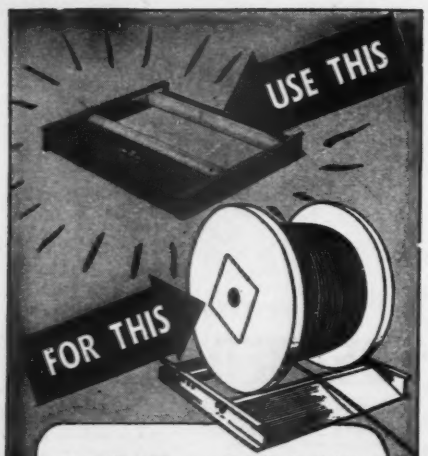
HANGERS, CLIPS, STRAPS, BUSHINGS

Expert design, choice materials and controlled manufacture have built "top-service and longest life" into Minerallac Electrical Specialties. That's why the electrical industry "prefers Minerallac"... In steel and Everdur for hanging pipe, conduit, BX cable, etc.

Send for new literature and prices.

MINERALLAC ELECTRIC COMPANY
25 North Peoria Street—Chicago 7, Illinois

MINERALLAC



Handles Heavy Reels Quickly ... Safely ... Economically

Saves time and money in the plant, warehouse or on the job.

Roll-A-Reel is the ideal way to reel or unreel wire, cable, or rope and does an easier, better job in every way.

In two sizes ... 2000 lbs. capacity—$37.50 and 4000 lbs. capacity — $75.00 F.O.B. Cincinnati.

Send for descriptive pamphlet.

ROLL-A-REEL
327 WEST FOURTH STREET
CINCINNATI 2, OHIO

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT : BUSINESS : "OPPORTUNITIES" : EQUIPMENT : USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

(Not available for equipment advertising)
15 CENTS A WORD. MINIMUM CHARGE $3.00.
Positions Wanted (full or part time individual salaried employment only), ½ the above rates payable in advance.
Box Numbers—Care of publication New York, Chicago or San Francisco offices count as 10 words.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display of advertisements.

The advertising rate is $8.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.
E.C.

POSITION VACANT

MINE ELECTRICIAN wanted for Nicaragua experienced in line work, motor winding, and switchboard. Must report single status first few months. Transportation, board and accommodation furnished by company. Salary open. Apply giving details, age, experience, salary desired. P-383, Electrical Contracting, 330 W. 42nd St., New York 18, N. Y.

PACIFIC NORTHWEST MANUFACTURERS' REPRESENTATIVE

Want to represent national lines electronic and electric equipment. Excellent contact with industrial trade, jobbers and marine outlets with service organization for lines represented.

RA-382, Electrical Contracting
68 Post Street, San Francisco 4, Cal.

Electrical Motors & Controls

ENCYCLOPEDIA

Complete, practical encyclopedia of reliable information on Electrical Motors and Controls. Understandably written. It contains nearly every type of connecting diagram for Fractional horsepower, 2 Phase, 3 Phase, and Direct Current Motors. All Standard circuits, as well as New Special Types of Variable speed, Multi-speed, Dual-Voltage and Capacitor Motors included. Hundreds of tables you need in your work. Practical methods of rewinding, reconnecting motors for speed, voltage, phase, frequency. 1947 Edition of 1000 ELECTRIC MOTOR DIAGRAMS & TABLES now available at $7.25. Satisfaction or full remittance refunded. Free literature.

EDUCATIONAL ADVANCEMENT COMPANY
Dept. EC Lakewood, New York

MOTORS FOR SALE

½ HP Westinghouse, DC, Frame 186, 1725 RPM, 115 volts, 4.7 amps, 40° C cont. rise.....$29.00
10 HP Wagner 220/440/3/60, 1730 RPM.....$94.00
G.E. 4 HP, 230 volt, 1400 RPM, Type BT..$225.00
Square D Push Button Station AC-DC 600 V..$1.50
G.E. Magnetic Switch, 220/1/60.....$6.50

GEORGE KOCH SONS, INC.
Evansville 4, Indiana

HEADQUARTERS FOR

WATTHOUR METERS

WE BUY & SELL

(Prompt Delivery)

ATLANTIC ELECTRIC METER CO.

214 East 41st Street
New York 17, N. Y.

ELECTRICAL EQUIPMENT WANTED

100 h.p. - 3 phase - 60 cycle - AC variable speed slip ring motor.
Control panel for 100 h.p. - 3 phase 60 cycle AC variable speed slip ring motor.
1—Motor driven drum or rotary switch for no less than 60 h.p. - 220 volts 3 phase - 60 cycles.
12—Magnetic contactors - 2 pst. - 20 amp. Contacts 200 volts - 1 phase 60 cycles coils.
8—Reversing magnetic contactors - 20 amp. Contactors 220 volts - 1 phase - 60 cycles coils.
3—3 h.p. 220 volts - DC Shunt wound motors for tension controls - totally closed.
2—Motor generator sets - 33 volts - DC - 2 KW at 1750 rpm.
1—Power panel for use with motor generator sets 32 volts - DC - 2 KW at 1750 rpm.
2—12 circuit power panel - 30 amp. 3 pole branches fused Conduit and fittings, all sizes ½" to 3½".

SHOPPING NEWS
5309 Hamilton Ave. • Cleveland, Ohio

ARMATURES
(Series Characteristics)
PRECISION RECONSTRUCTED

GUARANTEED TO BE REBUILT LIKE NEW

You are dealing direct with a factory specializing exclusively in small Armatures.

Write For Further Information

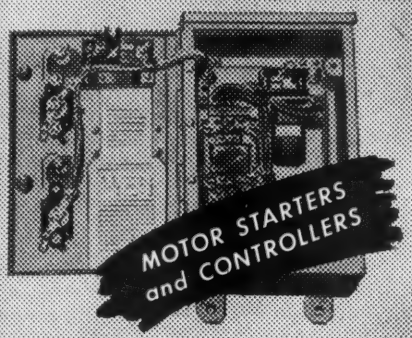
LEE WILSON CO., INC.
EGG HARBOR, N. J.

FOR PROMPT ANSWERS
to your business problems
use
The SEARCHLIGHT SECTIONS
(Classified Advertising)

American Machinist
Aviation
Business Week
Bus Transportation
Chemical Engineering
Coal Age
Construction Methods
Electrical Contracting
Electrical Merchandising
Electrical World
Electronics
Engineering and Mining Journal
Engineering News-Record
E. & M. J. Markets
Factory Management and Maintenance
Food Industries
Power
Product-Engineering
Textile World
Welding Engineer

For advertising rates or other information address
Classified Advertising Division
McGRAW-HILL PUBLISHING CO., INC.
New York 18, N. Y.

ELECTRICAL SUPPLIES *for* JOBBERS–CONTRACTORS–INDUSTRY

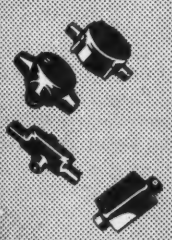


General Electric, Westinghouse, Cutler-Hammer, Ward Leonard and other makes, built to both commercial and Navy specifications. 115 and 230 volt DC; 220 and 440 volt AC; 60 cycle, 3 phase. Drip-proof, water-proof, manual and magnetic types. Unused and used.

ATTACHMENT PLUGS
Composition and rubber in a variety of grips. Fine quality.

CONNECTOR BODIES
Bakelite and composition, parallel slots, "T" slots, rugged construction.

KNIFE SWITCHES
Fuse, non-fuse — 2 and 3 pole — single and double throw.



CONDUIT FITTINGS
All types, for all purposes.

The electrical supply items shown here are but a fraction of the total surplus inventory. Use the coupon to indicate other items in which you are interested.

A huge inventory of government surplus electrical supplies is now available to dealers, jobbers, contractors and industrial users. Many scarce items are included in this sale—items which continue to be in short supply and are now offered at prices well below today's market for similar products.

***Act Now*—secure needed supplies and build up depleted stocks. Simply fill in the attached coupon and mail to your nearest War Assets Administration Regional Office.**

Send this coupon to your nearest WAA Regional Office:

I am interested in the following:

ITEMS	*DESCRIPTION*
.....	.....
.....	.....
.....	.....
.....	.....

Name.....

Firm.....

Address.....

City..... State.....

691-3

All electrical supplies are subject to priorities. VETERANS OF WORLD WAR II are invited to be certified at the War Assets Administration Certifying Office serving their area and then to purchase the material offered herein.

EXPORTERS: The War Assets Administration solicits your inquiries. Communicate with your foreign clients promptly.

WAR ASSETS ADMINISTRATION

GOVERNMENT OWNED SURPLUS

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Fort Worth • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • New York • Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane • Tulsa

691-3

Advertising In This Issue

*Accurate Mfg. Co. 12
*Adam Electric Co., Frank 61
Advance Transformer Co. 182
All-Bright Electric Products Co. .. 139
*Allen, L. B. 185
*Allen-Bradley Co. 135, 136
*Allis-Chalmers Mfg. Co. 11
*All-Steel Equipment, Inc. 37
Aluminum Co. of America 149
*American Steel & Wire Co. 26, 27
American Telephone & Telegraph Co. 10
*Anaconda Wire & Cable Co. 42
*Appleton Electric Co. 78
Arrow-Hart & Hegeman Elec. Co. .. 154
Arrowhead Sales & Dist. Co. 185
*Associated Projects Co. 150
Atlantic Elec. Meter Co. 186
Automatic Elec. & Mfg. Co. 177

Bakelite Corp. 2
Bell Telephone System 10
*Benjamin Elec Mfg. Co. 77, 118
Benjamin's For Motors 185
*Biddle Co., James G. 33
Blackhawk Mfg. Co. 110
Brady Company, W. H. 180
*Briegel Method Tool Co. 132
*Bright Light Reflector Co., Inc. 142
Bryant Electric Co., The 75
*BullDog Electric Products Co. ... 40, 76
Bunting Brass & Bronze Co., The .. 108
*Bussmann Mfg. Co. 70, 71

*Cannon Elec. Development Co. 171
Century Electric Co. 123
Certified Ballast Mfrs. 115
*Champion Lamp Works 170
Chelsea Products, Inc. 24
*Chicago Transformer Corp. Div. of Essex Wire Corp. 166
Clark Co., Robert H. 179
Coffing Hoist Company 93
Crescent Ins. Wire & Cable Co. 128
Crouse-Hinds Co. 23
*Curtis Lighting, Inc. 73
*Cutler-Hammer, Inc. 32

*Day-Brite Lighting, Inc. 74
*Dow Corning Corp. 160

Economy Fuse & Mfg. Co. 86
Educational Advancement Co. 186
*Efficiency Elec. & Mfg. Co. 179
Electric Equipment Co. 186
Electrical Eng. Exposition 180
Electromode Corp. 167

Federal Electric Products Co. 21
*Feedrail Corp. 143
*Fleur-O-Lier Mfrs. 4
*Fullman Mfg. Co. 164

*Gedney Electric Co. 114
General Cable Corp. 91
*General Electric Co. (Apparatus Dept.) Inside Front Cover, 5, 6, 7, 140
*General Electric Co. (Appliance & Merch. Dept.) Back Cover, 30, 80, 175
*General Electric Co. (Lamp. Dept.) 151
General Luminescent Corp. 178
Goodrich Chemical Co., B. F. 157
Goodrich Electric Co. 152
*Graybar Electric Co. 44, 65, 101, 102
*Greenlee Tool Co. 98
Guth Co., Edwin F. 144

*Hazard Ins. Wire Works 18
*Holdenline Company 13
Hubbell, Inc., Harvey 72
*Hullhorst Micro Tool Co. (Div. of Toledo Standard Comm. Co.) .. 184

*Ideal Industries, Inc. 20
*Ilg Electric Vent. Co. 67
*Illinois Electric Porcelain Co. 16
*Ilsco Copper Tube & Products Co. 181
*Insulation & Wires, Inc. .. 111, 131, 132
*Irvington Varnish & Ins. Co. 129

*Jefferson Electric Co. 82
Jenkins Bros. 25
*Johnson Bronze Co. 130
Jordan Bros., Inc. 177
Justrite Mfg. Co. 92

*Kahn Mfg. Co., Inc. 141
*Killark Elec. Mfg. Co. 29
Kirkland Co., H. R. 185
*Klein & Sons, Mathias 169
Koch Sons, Inc., George 186
Kondu Corp. 158

Lau Blower Co., The 161
*Leader Elec. Mfg. Corp. 87
*Lighting Products, Inc. 35
*Lint, Inc., Clyde W. 181
Lloyd Products Co. 173

*McGill Mfg. Co. 148
McGraw-Hill Book Co. 183
Mell-O-Chime & Signal Corp. 185
*Mercoid Corp. 95
*Metropolitan Device Corp. 1
Miller Co. 153
*Minerallac Electric Co. 186
*Mitchell Mfg. Co. 81
Monarch Fuse Co. 176
Multi Electric Mfg. Co. 184
*M & W Electric Mfg. Co. 134

National Elec. Products Corp. 88
North American Electric Lamp Co. 179
Nu Tone, Inc. 36

*Okonite Co. 18
*Onan & Sons, D. W. 179
*O. Z. Electrical Mfg. Co. 117

*Paine Co., The 134
Paragon Electric Co. 138
Pass & Seymour, Inc. 183
*Pelham Elec. Mfg. Corp. 116
*Penn-Union Electric Corp. 183
Porcelain Group 16
*Porcelain Products, Inc. 16, 112
*Pyle-National Co., The 134

*Quadrangle Mfg. Co. 172

Reading Electric Co., Inc. 182
*Reliance Automatic Lighting, Inc. . 181
Republic Steel Corp. 68, 69
*Revere Elec. Mfg. Co. 83
*Ridge Tool Co. 14
*RLM Standards Inst., Inc. 106
Robertson Co., H. H. 22
*Rockbestos Products Corp. 34
*Roebling's Sons Co., John A. 99, 126, 127
*Roll-A-Reel 186
Royal Electric Co. 156
*Rusgreen Mfg. Co. 183
*Russell & Stoll Co. 174

*Sangamo Electric Co. 162
Searchlight Section 186
*Sherman Mfg. Co., H. B. 168
Shopping News 186
*Simplet Electric Co. 177
Simplex Wire & Cable Co. 94
Smith Iron Co., A. L. 85
*Sorgel Electric Co. 113
*Spang-Chalfant (Division of the National Supply Co.) 31
*Specialty Porcelain Works 16
*Square D Company ..... Inside Back Cover, 63, 90
Steel & Tubes Division 68, 69
*Sticht Co., Herman H. 181
*Superior Carbon Prod. Co., Inc. .. 177
*Superior Porcelain Co. 16
Syntron Company 184

Thomas & Betts Co., The 66
*Toledo Pipe Threading Mach. Co. 8
*Toledo Standard Commutator Co. .. 184
*Tork Clock Co., Inc. 181
Trico Fuse Mfg. Co. 130
*Trumbull Electric Mfg. Co. 84

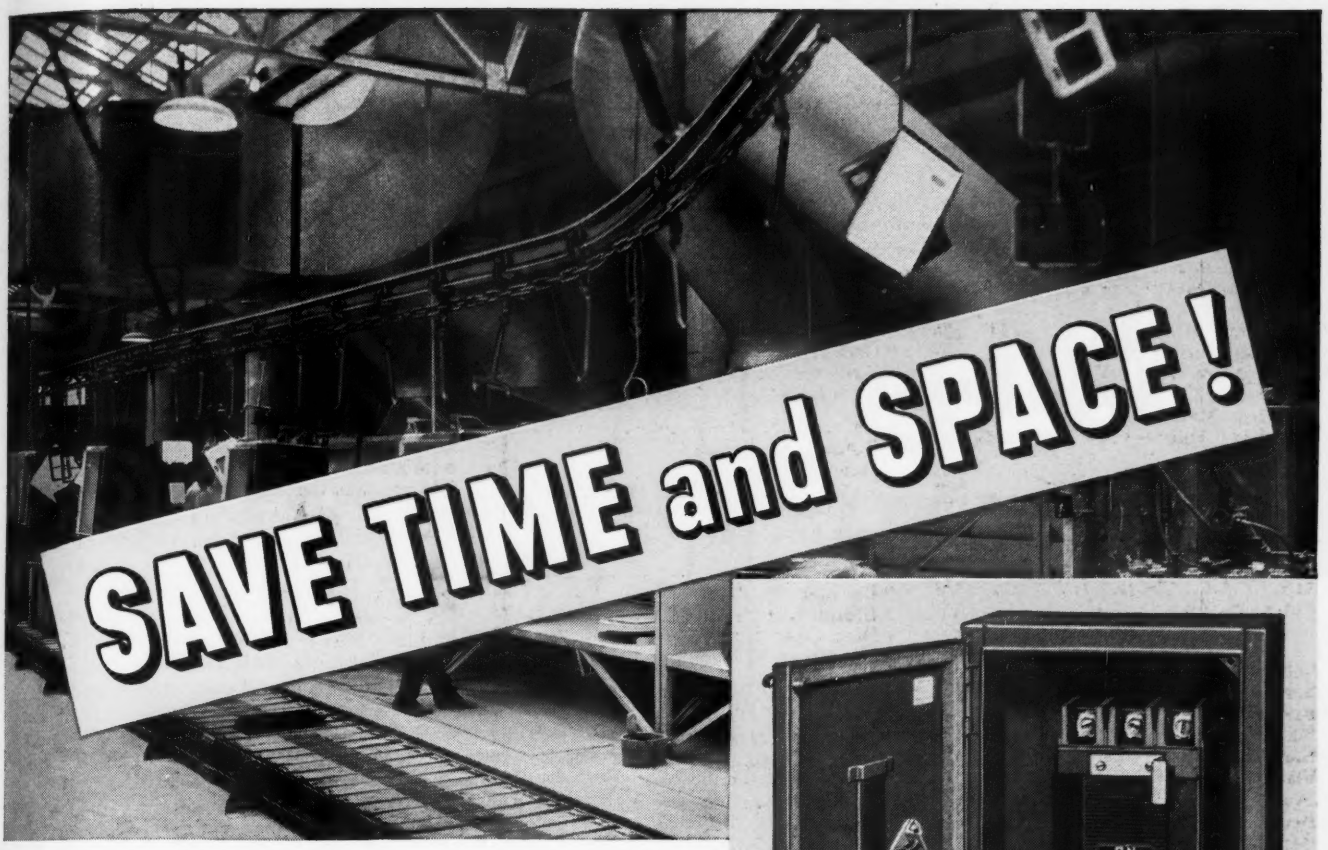
*United States Rubber Co. 9, 104
*United States Steel Corp. 26, 27
United States Treasury Dept. 165
*Universal Clay Products Co. 16

Virden Co., John C. 15

Wagner Electric Corp. 28, 125
Wakefield Brass Mfg. Co. 79
War Assets Administration 187
*Ward Leonard Elec. Co. 178
*Ware Brothers, Inc. 133
*Webster Electric Co. 97
*Westinghouse Elec. Corp. (Pittsburgh) 59
*Westinghouse Elec. Corp. (Lamp Div.) 146, 147
*Westinghouse Electric Corp. (Light-Div.) 19
*Weston Elec'l Instrument Corp. 100
*Wheeler Reflector Co. 89
Where To Buy 185
Wilson Co., Inc. Lee 186
Wiremold Company 159
Wodack Elec. Tool Corp. 185
*Wurdack Elec. Mfg. Co., Wm. 17

Youngstown Sheet & Tube Co. 96

★ These companies have supplied additional buying information on their products in the 1946 edition of the Electrical Buyers' Reference

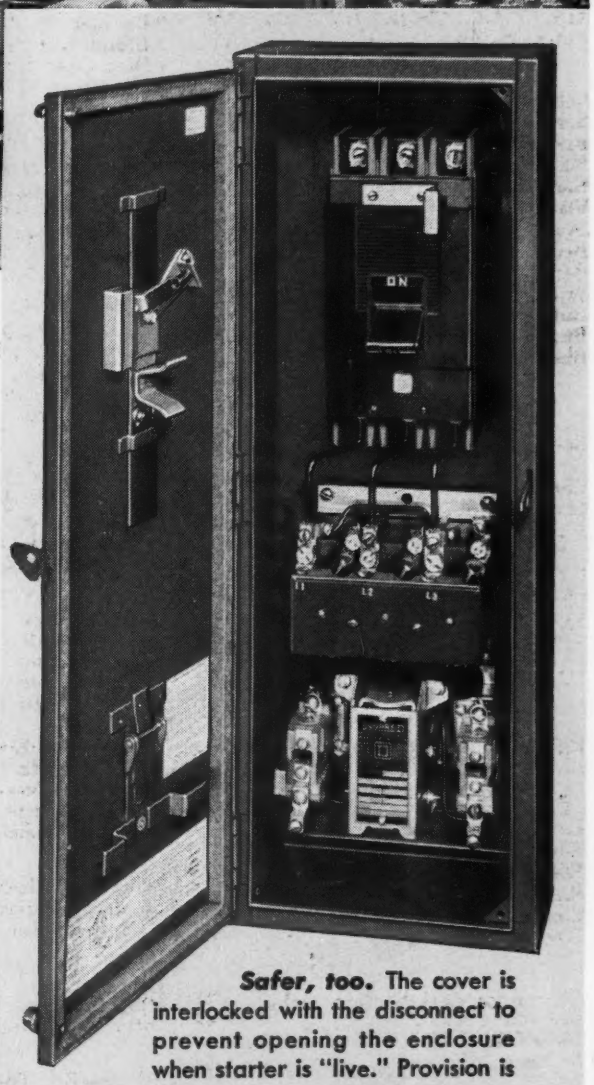


Square D Front-operated Combination Starters

● You save time by using combination starters. Since the disconnect (switch or breaker) and the magnetic starter are housed in one enclosure, you cut mounting time in half and also save wiring time.

A combination starter takes less space than two separate devices. These Square D front-operated units save still more space. They are especially suitable for "ganging."

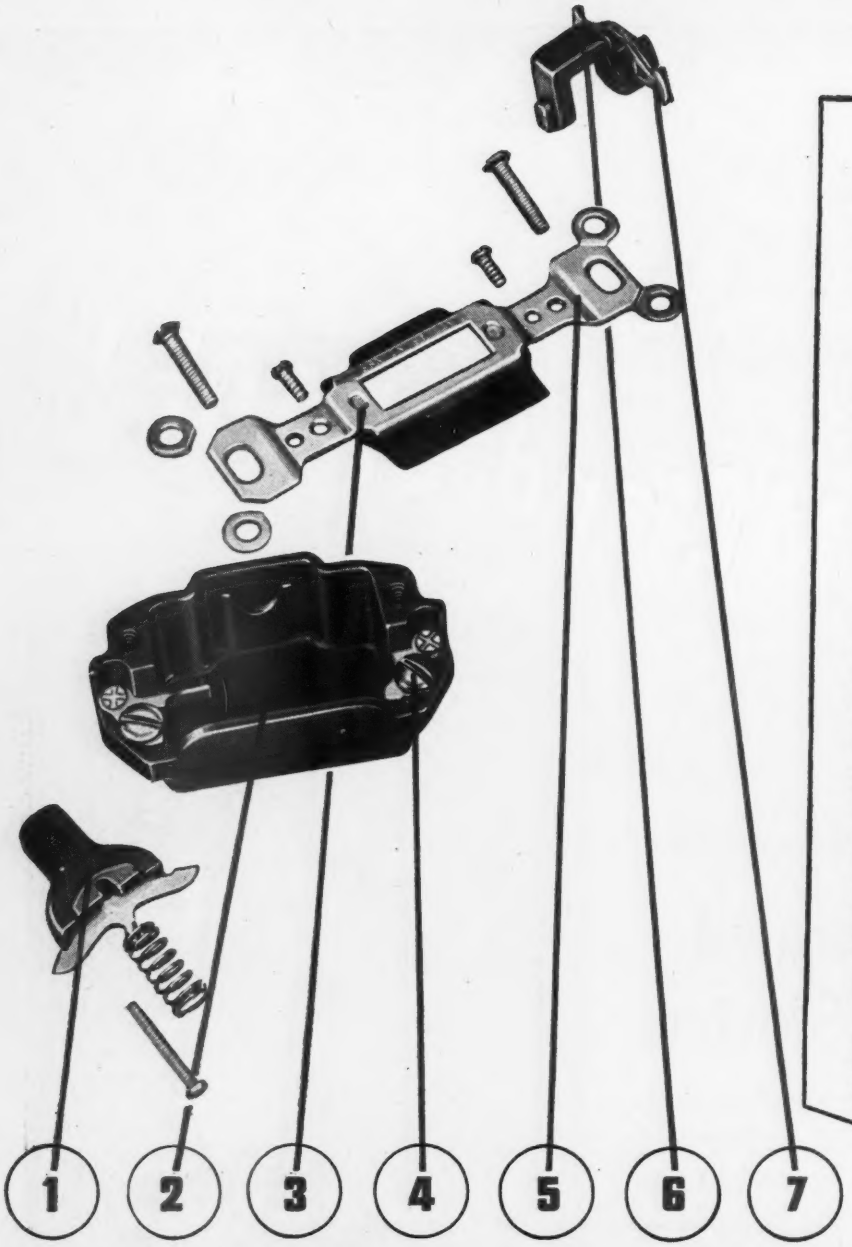
Square D front-operated starters are available in three capacities—sizes 0, I, and II. Some types of larger sizes are side-operated. For informative bulletin, address Square D Company, Industrial Controller Division, 4041 North Richards St., Milwaukee 12, Wis.



Safer, too. **The cover is interlocked with the disconnect to prevent opening the enclosure when starter is "live." Provision is also made for padlocking the disconnect in the "OFF" position.**

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES



G-E SWITCH FEATURES

1 Strong, tough, molded Textolite* trigger handles withstand abuse without breaking.

2 Textolite box resists breakage, oils, and corrosive atmospheres. It has much less bulk than porcelain, thus providing maximum room for wire.

3 The wide ear-type crossbar assures automatic adjustment and correct alignment of switch to mounting surface. The four corner projections break off to provide handy metal washers for bushing-up switch behind box mounting screws. Drive screws fasten crossbar securely without use of nuts. (Illustration shows two washers detached.)

4 Binding screws are upset to prevent falling out, and are large enough to accommodate No. 12 wire.

5 This switch is T-rated for 10 amp at 125 v, 5 amp at 250 v. It is approved by Underwriters' Laboratories, Inc.

6 The Textolite blade carrier is an outstanding feature of this switch; other switches, to our knowledge, have metal blade carriers. The use of Textolite eliminates the need for insulating fiber washers, which tend to swell or distort, causing switch failures. Textolite assures full insulating protection together with strength and stability.

7 The switch mechanism has phosphor bronze blades for lasting spring tension. Split blade design provides better contact than solid blade and split contact types. A compression-type actuating spring assures operation with minimum arcing and maximum spring life. Action of the blades is fast and positive.

**Trade-mark Reg. U. S. Pat. Off.*

IF IT'S **INNER STRENGTH** *YOU'RE AFTER*

LOOK AT THIS "INSIDE STORY" OF G-E SWITCH CONSTRUCTION

This exploded view shows the sturdy construction and compact design that make G-E standard switches the answer to any electrical maintenance man's prayer.

All parts are *built to last.* There are no weak links to cause early failure and frequent replacement. Even the handles are extra tough, to guard against breakage from careless blows.

The switch illustrated here is a T-rated, fine-quality switch for standard, high-grade installations. G.E. makes a full line that includes all grades, as well as silent and special switches. Every G-E switch lives up to every claim made for it — and perhaps a little more, because we don't believe in skimping on quality.

Check the outstanding advantages listed in the panel above. Then, on your next installation, remember to use G-E switches — you'll be sure to get the best.

For information on the full line of G-E wiring devices, write Section D15-118, Appliance and Merchandise Department, General Electric Company, Bridgeport 2, Conn.

GENERAL ELECTRIC